



UP RAJYA VIDYUT UTPADAN NIGAM LIMITED.

2 X 500MW ANPARA D TPS

**AT
SONEBHADRA, UTTAR PRADESH**

VOLUME IIB & III

**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPECIFICATION NO.: PE-TS-298-502-A001



BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, U.P

INDIA



TITLE

**2X500 MW ANPARA D TPP
ELEVATOR**

SPECIFICATION NO. PE-TS-298-502-A001

VOLUME: II B

REV 00

SHEET 1 OF 1

**INDEX
VOLUME – IIB**

SECTIONS	TITLE	Page No.
I	SPECIFIC TECHNICAL REQUIREMENT	
IA	SPECIFIC TECHNICAL REQUIREMENT (MECHANICAL)	1-3
	INTENT OF SPECIFICATIONS/ SCOPE OF ENQUIRY	
	SCOPE OF SUPPLY & SERVICES	4-20
	GENERAL TECHNICAL REQUIREMENT	21-76
	FUNCTIONAL / PERFORMANCE / DEMONSTRATION GUARANTEE (AS APPLICABLE)	77-78
	QUALITY ASSURANCE	79-84
	ANNEXURE-I- LIST OF MAKES	85-86
	ANNEXURE-II- MANDATORY SPARE LIST	87-89
	ANNEXURE-III- LIST OF TOOLS & TACKLES	90-91
	ANNEXURE-IV- DRAWING / DOCUMENT SUBMISSION SCHEDULE	92
	ANNEXURE-V- MAIN DRAWING LIST WITH SCHEDULE OF SUBMISSION	93
	ANNEXURE-VI- FORMAT FOR OPERATION AND MAINTENANCE MANUAL	94-96
	ANNEXURE-VII- CIVIL INPUT	97-101
	ANNEXURE-VIII- SITE STORAGE AND PRESERVATION.	102-116
IB	SPECIFIC TECHNICAL REQUIREMENT (ELECTRICAL)	117-133
IC	DATA SHEET-A	134-138
II	STANDARD TECHNICAL SPECIFICATION REQUIREMENT	139-144
IIA	STANDARD TECHNICAL SPECIFICATION REQUIREMENT (ELECTRICAL)	
III	DOCUMENTS TO BE SUBMITTED BY THE BIDDER	145-146
IIIA	LIST OF DOCUMENTS TO BE SUBMITTED WITH BID	147
IIIB	COMPLIANCE CUM CONFIRMATION CERTIFICATE	148-149
IIIC	ELECTRICAL LOAD LIST	150
IIID	SCHEDULE OF TECHNICAL DEVIATION	151
IIIE	PRE BID CLARIFICATION SCHEDULE	152



TITLE

**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE – TS - 298 - 502 – A001

VOLUME II B

SECTION IA

REV 0

DATE 07.12.2017

SHEET

OF

SECTION - IA

SPECIFIC TECHNICAL REQUIREMENT (MECHANICAL)

	TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE – TS - 298 - 502 – A001	
		VOLUME	II B
		SECTION	IA
		REV 0	DATE 07.12.2017
		SHEET	OF

SCOPE OF ENQUIRY / INTENT OF SPECIFICATION

- 1.1 This specification includes, but not limited to design, engineering, material selection, manufacturing and assembly, inspection, testing at manufacturer's works, packing, forwarding and transportation to site, unloading, storage & handling at site, erection & commissioning, carrying out trial run and acceptance / functional guarantee test at site & final painting of passenger elevator for **2X500 MW ANPARA D TPS at SONEBHADRA district, UTTAR PRADESH STATE** and necessary accessories including supply of, erection and commissioning spares, special maintenance tools and tackles etc.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the responsibility of providing such facilities to complete the supply, erection and commissioning of the **Elevators** and its accessories.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.
- 1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or customer including their consultant as interpreted by BHEL in the relevant context.

	TITLE TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE – TS - 298 - 502 – A001	
		VOLUME	II B
		SECTION	IA
		REV 0	DATE 07.12.2017
		SHEET	OF

1.11 The standard quality plan is included in this specification to enable the bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the quality plan as minimum requirement during manufacturing and testing.

1.12 Site Visit before submission of offer.

Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details wrt existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering.

1.13 Compliance cum confirmation certificate is to be accepted by bidder without any modification.

1.14 Other requirements

Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 1 OF 12	

SCOPE OF SUPPLY & SERVICES, EXCLUSION AND TERMINAL POINTS.



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07.12.2017

SHEET 2 OF 12

1.0 Introduction

Passenger elevator shall be provided for access to various operating floors / platforms in Administrative building and Service building for 2X500 MW ANPARA D TPS to facilitate movement of operating and maintenance personnel.

2.0 Scope of equipment supply and services

2.0.1 Design, Engineering, Manufacture, Inspection & Testing at manufacturer's works or at their sub-vendor's works, painting at manufacturer's or at their sub-vendor's works, duly packed for transportation to site, delivery to site, storage and handling at site, Erection & Commissioning, carrying out trial run and Acceptance / functional tests at site & final painting of Passenger Elevators for 2 X 500 MW ANPARA D TPP as listed below: -

Sl. no	Building	No. of elevators	Capacity	No. of landings	Total rise	Type	Speed
1	Service Building	2 Nos.	1088 Kg	Five including ground (0.0 m, 4.25 m, 8.5 m, 12.75 m, & last landing 17.0 m)	17.0 M	Panoramic Type (passenger elevator)	1.0 M/s
2	Administrative Building	2 Nos.	884 Kg	Three including ground (0.0 m, 4.5 m, & last landing at 8.5)	8.5 M	Panoramic Type (passenger elevator)	1.0 M/s

2.0.2 Elevator shall include but shall not be limited to the following: -

- 1) Elevator car with SS 304, 1.5 mm (min) thick sheet of hair line finish.
- 2) Guide rails for car and counterweights.
- 3) Counterweight.
- 4) DCEM brakes.
- 5) Spring buffer for car and counterweight.
- 6) Driving arrangement including motor, gear box, sheaves etc.
- 7) All electrical equipment including power cable, control cable, controller panel, safety devices including push buttons, limit switches, safety switches, indicators etc.
- 8) Isolating switch / MCBs.
- 9) Car doors, car ceiling and hoist way doors of SS 304, 1.5 MM (min) thick sheet of hair line finish.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 3 OF 12	
10) Car operating panel, digital control, car position indicator at all floors, luminous hall buttons, auto door operating mechanism, alarm bell, car light & car fan. 11) Intercom connection through EPABX or PA which shall be finalized during contract stage. 12) Ropes for hoisting. 13) Circuit breaker, switch fuse unit etc. in machine room for terminating the power supply cable (power supply cable provided by purchaser up to machine room level), other power/control and trailing cabling and equipment earthing. 14) Ladder in pits. 15) Emergency light with rechargeable battery. 16) All fixing materials require fixing rails, brackets, equipment including nuts and bolts. 17) Fascia plates (750 mm minimum) & sill angels. 18) Full length infra-red Curtain safety feature in door along with pressure limiter as an extra mechanical safety. 19) ELCB, if required as per statutory requirement. 20) Any other equipment required to meet the requirement of local statutory and regulatory body and prevailing lift etc. 21) Car lighting, CFL / LED light fittings for illumination level of 100 lux on car floor. 22) Elevator shaft, pit cable conduit fixtures, switches 3 pin or as required by bidder during erection / maintenance purpose at every 3 m. 23) Mirror for the car rear panel. 24) Floor announcement cum music system to be provided. 25) Maintenance tools and tackles along with un-priced list with the offer. 26) Recommended spares for three (3) years of trouble operation. Bidder to furnish un-priced list along with the offer. 27) Three (3) sided SS- mirror finish hand railing at suitable height. 28) Minor civil work including grouting as well as foundation bolt grouting as required during installation of elevator.			

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 4 OF 12	

29) Scaffolding for erection.

30) Automatic rescue device with battery drive - Modern advanced electronic drive system of rescuing passenger trapped in an elevator shall be provided.

31) Emergency safety devices - The lift shall be provided with safety device attached to the lift car frame and sustaining the lift car up at governor tripping speed with full rated load in car.

32) All steel embedment for fixing landing doors / indicators etc. to the elevator well shaft and fascia plate shall be supplied by the bidder

33) Guide rails complete with supporting brackets for the car and counter weights.

34) Elevator drive machines complete with electric motor, reduction gear unit, suspension ropes, buffers for the cars and the counter weights and other drives and control mechanism. All foundation anchor bolts, sleeves, anchoring steels and any item required to complete the job satisfactorily shall be provided by the bidder. The bidder shall also provide for the grouting of anchor bolts, sleeves, anchoring steel etc. and other anchorages.

35) Any other steel works as well as all other accessories / components not specified in the technical specification but necessary for making the elevator complete.

36) All minor building works including the supply of steel items, associated with installations of equipments in the machine room hoist way, hoist way door, frames and elevator pit, shall form part of bidder's scope of supply, BHEL / customer will provide the elevator well complete with foundation and brick walls around the lift well together with overhead machine room. The machine room will be provided with RCC floor slab with necessary pockets for anchor bolts and slots.

37) Dummy landing/s, as required in case travel between two consecutive landings is more than 10 m, shall be considered by bidder in his offer.

38) Any other requirement stipulated by state statutory body and prevailing local lift act requirement shall also to be included by bidder in their scope.

39) Bidder shall use latest IS 14665 (all parts) for outline dimensions of elevator & shaft, installation, operation, maintenance & inspection and testing and for elevator components design.

40) Mandatory Spares:

A complete unused and new set of Mandatory Spare parts shall be supplied. The items supplied shall be of the best quality and specially protected against rusting in tropical climate. The minimum requirement of mandatory spare parts is listed in Annexure –II section-IA, of this specification.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 5 OF 12	

NOTES:

- 1) Bidder to note that elevator shaft, pit, buffer blocks, machine room and other civil construction is already completed at site. Reference civil drawings for the same are attached with this specification. Bidder has to ensure that the elevator quoted by them is suitable for erection in already constructed shaft, pit and machine room etc. Any modifications required in the civil structure for erection of elevators being offered by bidder, shall be carried out by bidder during E&C of the elevator at site.
It is therefore suggested that bidder, in their own welfare, should visit site to have details of already constructed elevators shafts before quoting.
- 2) Flooring for all elevators shall be vitrified ceramic tiles of mat finish as indicated in the Data sheet.
- 3) Functional Guarantee test shall be carried out at site for over speed test and over load test, travel and hoist speed checks as per latest IS.
- 4) Car, landing door, car ceiling and false ceiling shall be of SS-304 sheet with thickness (min) 1.5 mm.
- 5) Min dimensions as specified in applicable IS 14665 (all five parts) shall be considered / provided for lift shaft / pit / car / M/c Room. Safety requirement shall be as per latest IS 14665 (Relevant part). Bidder to refer the layout attached in the specification for different buildings.
- 6) All Equipment's / facilities needed for erection & commissioning shall be in bidder's scope.
- 7) Bidder to note that all LT Power cables (Fixed power and control cables etc), Trailing cable and instrument / signal cable for elevator shall be as per electrical specification. Trailing cable shall be FRLS type (with strain bearing member).
- 8) Make of various bought out items & QAP shall subject to approval of BHEL / Customer during detail engineering stage without any commercial implication at contract stage.
- 9) Bidder shall supply erection and commissioning spares as required during E&C stage without any commercial implication.
- 10) Car frame and structure (guide brackets, supports etc) shall be painted with epoxy based paint for all elevators.
- 11) Protection class for motor shall be IP 54 and main control panel shall be min IP 21 and elevator control shall be VVVF type. Push buttons, Car operating Panel, Landing Operating Panel, Landing door motor and other equipment shall be IP-54.
- 12) Factor of safety for rope shall be 12 (min).

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 6 OF 12	

13) All Landing door shall be fire rated for at min 2 hour or as per latest IS / as per the state statutory requirement whichever is more stringent.

14) Motor shall be S4 / S5 duty with insulation class F & temp rise limited to class B.

15) Bidder shall submit the following documents (min) for BHEL/customer approval during detail engineering stage:-

- a) General arrangement of Elevator.
 - b) Technical data sheet of elevator.
 - c) Technical data sheet of motor along with power, control and trailing cable details
 - d) Wiring schematic diagram.
 - e) MQP for elevator along with test procedure of various components.
- 16) Bidder shall comply to the quality requirements as enclosed with specification. Quality plan shall be submitted by the successful bidder for approval during detail engineering.
- 17) Bidder shall confirm that supply, installation and commissioning of elevator shall be completed within project schedule as indicated elsewhere from placement of intent / letter of intent.
- 18) Bidder shall be responsible for obtaining all necessary approval from statutory and regulatory body and lift inspector. However, purchaser will furnish required information time to time basis, if required.
- 19) Bidder shall include scaffoldings required in their scope of work.
- 20) Elevator shall be provided with AC VVVF type drive control system.

3.0 SCOPE OF SERVICES

Scope of services will broadly include the followings: -

- 1) Complete erection, testing and commissioning including all testing and commissioning materials, consumables and other tools and tackles required for erection of complete elevator package.
- 2) Painting of all equipments / items within the battery limit.
- 3) Unloading, storage, handling and transportation at site for all items of elevator.
- 4) Minor civil and structural works shall be carried out by the bidder if required at site for which no additional commercial implication shall be entertained by BHEL.
- 5) Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities, if any, shall be arranged by the successful bidder at their own cost.
- 6) Functional testing of complete elevator package.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 7 OF 12	

7) Preparation of civil input drawings including elevator pit, shaft, machine room etc.

8) Preparation of all necessary drawings / data sheets / documents / calculations as required for obtaining necessary local administration permits / approval from statutory authority and make arrangements for inspection and tests required thereby for necessary approval on behalf of the customer. Fees as required for obtaining approval from statutory bodies shall also be included in the scope of work of the bidder.

9) Any other service as required for making the installation complete in all respect and satisfactory erection and commissioning of the system.

10) Relevant requirements as per GCC, ECC & SCC.

11) Window Air conditioner of min 2 Ton capacity in the machine room which includes fans, air filter and accessories to prevent dust ingress in the machine room. However, successful bidder shall furnish the heat load calculation and capacity of air conditioner after considering all actual heat loads of elevator machine room during detail engineering stage for selection of final capacity of air conditioner.

12) 1/2 Kg CO2/suitable type Fire extinguisher in bidder scope. Fixing arrangement shall be provided in Car accordingly.

4.0 Exclusion

1) Complete civil works for hoist way, machine room, pit complete with the side enclosure (brick / RCC), interconnecting platform (if any) and monorail beam.

2) Electric hoist with travelling trolley of 3T capacity to facilitate handling of equipment in the machine room.

3) Power supply cable (AC 415 V, 3 Ph, 50 Hz) up to machine room level. Further cabling (all cables including power, control and instrumentation as per tender specification) shall be provided by the bidder.

4) Electrical exclusion as per separate scope sheet attached in the specification.

5.0 Operation

Elevator shall have provision to meet followings operational requirements: -

a) Selective simplex / duplex collective, automatic operation with or without attendant through illuminated push button station located inside the lift car.

b) Door operating shall be automatic door operation and electronic door protection system for opening / closing of car and landing doors.

c) Bidder shall provide car operating panel with luminous buttons, car position indication in car (both visual and audio) combined with direction arrows, overload

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 8 OF 12	

warning indicator, battery operated alarm bell and emergency light and fan and hands free speaker telephone set with suitable battery, charger and controls.

d) Bidder shall provide emergency indicator to indicate the location of elevator in case of elevator being stuck up between the floors through automatic flashers/ display (both audio and visual as out of service).

e) Two (2) push buttons, one for upward movement and the other for downward movement at each intermediate landing and one (1) push button at each terminal landing shall be provided in order to call the car. Digital hall position indicator at all floors, tell lights at all floors shall also be provided by the bidder.

f) All fixtures shall be in stainless steel face plates.

g) Push buttons shall be fixed in the car for holding the door open for any length of time required.

h) All other safety / protection / operation interlocks as required by IS – 14665 (all parts) latest edition.

6.0 Electric Motor

The driving motors shall conform to IS 325 and suitable for variable voltage variable frequency (VVVF) application. All motors shall be squirrel cage induction type, suitable for operation at 415 V (+/- 10% variation), 3 Phase, 4 wire, 50 Hz (+5% to -5% variation) supply. Motors shall be provided with class F insulation & temp rise limited to class 130 (B).

7.0 Controls

The control shall be variable voltage and variable frequency type and shall provide smooth and constant acceleration and retardation under all conditions of operation. Suitable control panels shall be provided in the machine room. The lift will be automatically stopped by upper and lower terminal switches. The elevators will have an emergency stop switch, limit switches and other safety devices according to statutory rule.

8.0 Cables and wirings

All the cables except trailing cables shall be as per IS 1554-1 or IS 7098-1. The PVC outer sheath of these cables shall be flame retardant, low smoke (FRLS) type.

Trailing cable:
The circular trailing cables shall be either in accordance with IS 4289 Part-I (Elastomer insulated) or IS 4289 Part II (PVC insulated). The flat type trailing cables if offered shall be in accordance with IEC 60227-6.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 9 OF 12	

All wiring/ cabling between the equipments in the lift machine room and that between the machine room and equipments in the lift well and at the landings shall be wired in HDP conduits/ galvanized steel conduits to be supplied by the elevator supplier. Alternatively, armored cables may be used. However, bidder shall refer detailed Specification of cables / wirings elsewhere in the specification.

9.0 Earthing

The elevator structures and all electrical equipments, including metal conduits shall be effectively earthed with the earth conductors provided in the machine room as per IS 3043.

10.0 DESIGN CRITERIA

The design criteria and equipment specification will be as follows:

- i) The rated speed will be one (1) m/sec. Proper allowance will be made for impact and wear and the factor of safety for rope shall not be less than twelve (12) or as per IS 14665 (all parts). The suspension wire rope will confirm to IS-14665 or approved equivalent international standard.
- ii) The lift will be providing with automatic travelling device which will take care of overrun and under run of the car and rope stretch that the car floor is within 6.0 mm from the landing level at the floors while in operation.
- iii) The lift will be equipped with upper and lower terminal switches arranged to stop the car automatically within the limit of the top car clearance and bottom run-by, from the any normal operating speed.
- iv) The elevator car shall be provided with SS-304 sheet fabricated, hair line finished (including landing doors of the car). Vitrified ceramic tile of matt finish flooring as indicated in the data sheet - A, concealed fan and indirect lighting, emergency lighting, intercom, car position and travel direction indicator.
- v) As the elevator is to provide service in a power station, it is necessary for the equipment to be specially coated (painted). This will include application of anticorrosive paint as applicable. The electrical equipment will have enclosures meeting degree of protection as covered under electrical specification.
- vi) The elevator as a whole will comply with relevant Indian Standard i.e. 14665 or approved international standard. The outline dimensions of electric lift shall meet the requirements of IS 14665 (latest edition).
- vii) The elevator shall be provided with AC VVVF type drive control system.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 10 OF 12	

viii) Doors are automatic, center opening with emergency key opening at all landings, horizontal sliding type for car as well as for hoist way. Trap door shall be provided by client as per IS-14665 (latest edition).

11.0 Other Technical Requirements

1) Characteristic curves of all motors shall be furnished by the bidder during detail engineering stage for approval showing torque, speed, current and voltage.

2) Electrical requirements shall be as per requirements enclosed elsewhere in the specification.

3) Complete elevator installation shall be in accordance with the requirements of concerned approving authority.

4) In case of any contradictory requirement amongst the various clauses within the specification and clarifications not having been sought by the bidders, the most stringent requirement as per interpretation of BHEL’s engineer shall be final and binding on the bidder for which BHEL will not entertain any commercial implication.

5) Data sheets of various items shall be prepared by the bidder and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

6) GA drawing indicating design data, material of construction etc. shall be prepared by the bidder during detail engineering stage based on specification / contractual requirement and there should be no commercial implication on account of finalization of the drawings and documents.

7) O & M manual shall be furnished to BHEL / customer / consultant for approval during detailed engineering stage.

8) Field quality plan / quality assurance plan / check list shall be prepared by the bidder for each item of elevator and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

9) All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.

10) Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 11 OF 12	

11)

Bidder to note that all the drawings shall be prepared in Auto Cad - 2010 version and required number of hardcopies and soft copies shall be furnished to BHEL during detailed engineering stage. Exact requirement of number of hard copies and soft copies of all drawings and documents as required by BHEL / customer / consultant shall be informed to the successful bidder during detail engineering stage and bidder to furnish the same for which no additional cost shall be entertained.

12)

21 days' time is required by BHEL to offer their comments on the drawings and documents being submitted by the bidder (during detailed engineering stage in the event of L.O.I being placed) from the date of receipt.

13)

Civil works will be provided by BHEL / customer. Hence, bidder has to furnish the civil inputs in time. Bidder has to carry out the rectification in the civil works in the event of any changes in the civil input data furnished by them or delay in submission of input data by them. Bidder to furnish the civil foundation drawing along with the loading data for approval during detailed engineering stage showing / indicating the followings: -

a)

Scope of work by BHEL and bidder shall be indicated with different legend or in the form of note.

b)

Recommended locations of earthing pads.

c)

Civil loads along with detailed calculation of loading

d)

Details of pockets / cut outs as required for anchor bolts.

14)

Bidder to depute competent designer (s) at BHEL's office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL. However, minimum seven (7) days' notice shall be served for the same.

15)

All the drawings which are required to be furnished to BHEL during detailed engineering stage shall include technical parameters, details of paints, BOQ / BOM etc in tabular form indicating all components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

16)

All drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.:-

a)

All drawings and documents shall bear BHEL's title block and drawing / document number. However, BHEL's drawing / document numbering scheme shall be furnished to the successful bidder after the placement of L.O.I.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 12 OF 12	

b) All drawings and documents shall indicate the list of all reference drawings including general arrangement.

c) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view, all major self manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.

d) Specification / schedule of painting shall be made as a part of general arrangement drawing of each item indicating at least three (3) makes.

17) Bidder to assess the capability of their sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them. No deviations shall be entertained.

18) Bidder to furnish prices and unit price of each item of proposed system as per BHEL’s price format only along with the final price bid.

19) Bidder shall check that specifications of all the items are available in the NIT specification. However, in the event of absence of specification for any item, bidder will approach BHEL to furnish the specification of missing items and new specification will be adhered by the bidder for which no commercial implication shall be entertained by BHEL.

20) Bar chart, list of drawings and documents including data sheet, manual calculation, quality plan, field quality plan, PG test procedure, list of sub – vendors (mechanical, C & I and erection and commissioning), technical specification and material of construction, painting specification / schedule, dispatch schedule etc. of various items as required by BHEL / customer / consultant shall be submitted to BHEL / customer / consultant during detail engineering stage for approval and the approved drawings / documents shall be adhered by the bidder without any commercial implication.

21) List of commissioning spares and tools and tackles in terms of numbers shall be furnished by the bidder along with the offer.

22) “Technical deviations” shall be clearly indicated in bidder’s offer in prescribed format only.

23) All drawings shall be prepared as per BHEL's title block and bear BHEL's drawing No. and customer / consultant’s drawing no; which will be forwarded to the successful bidder during detail engineering stage.

CLAUSE NO.	Scope of Supply and Services	एनटीपीसी NTPC		
1.00.00	ELEVATORS			
1.01.00	PASSENGER ELEVATORS Panoramic Two number of conventional type passenger elevator having a capacity of 16 persons/ 1088 kgs. each for (1) TG building (2) Service building . One number of conventional type passenger elevator having a capacity of 8 persons for each ESP control rooms The scope shall include all items/ accessories, service etc. required to meet all design, installation, operation, safety, protection and other requirements of IS: 14665 (all parts), 'Electric Traction Lifts'. The scope shall include all items/ devices needed to comply with the requirements indicated in Part 'B' and the supply of following for each elevator: (i) one (1) no. fireman's switch (ii) Machinery supporting beam (iii) Air conditioned machine room and adequately sized a/c system (not less than 2 T capacity).			
ANPARA-D(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.:	TECHNICAL SPECIFICATIONS SECTION VI, PART-A	SubSection-II-A-7 Elevators and Cranes	Page 1 of 2

Clause No.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
	ii) Design seismic Co-efficient	According to IS :1893-77 (Zone III)	
	iii) The hook approaches for either sides shall be as per owner's requirements/code/standard		
	iv) Approximate max. full load speed after discussion with owner.		
	Note: The above parameters are tentative. Owner reserves the right to change the parameters of crane during finalization of design.		
2.00.00	SERVICE ELEVATORS		
2.01.00	DESIGN CRITERA AND OPERATIONAL SPECIFICATION		
2.01.01	Design		
	Elevator shall be of conventional enclosure type for Service Building, ESP Control Rooms & TG buildings . The elevator shall meet the quality of international standard.		
2.01.02	No. of floors to be served shall be as required. The final landing elevations for all buildings shall be subject to approval by the Employer after award. Bidders shall quote for variation in price for addition/deletion of one landing level in the relevant schedule of Forms and Procedures.		
2.01.03	Elevators shall be designed based on following criteria :		
	i)	Design/construction/installation codes.	: a) Latest edition of IS: 14665 (all parts)
	ii)	Load carrying capacity	: a) 1088 kgs. (equivalent to 16 persons) for passenger elevator for Service building and TG Building. b) Equivalent to 8 persons for passenger elevator for each ESP/VFD Building.
	iii)	Rated speed	: 1.0 m/sec.
	iv)	Position of machine room	: Directly above the lift shaft.
Anpara 'D' (2X500MW) MAIN PLANT TURNKEY PACKAGE		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION-VI, PART B
		SUB-SECTION-III-A-09 Crane Hoist & Service Elevators	Page 2 of 5

Clause No.	TECHNICAL REQUIREMENTS				एनडीपीसी NTPC
	v)	Machine room	:	Air-conditioned Machine Room as per the requirements of lift manufacturer. (Min 2 T Air conditioner to be provided)	
	vi)	Operation of elevator		a) Selective duplex collective automotive operation with or without attendant. b) Provision for locking control in auto or attendant position.	
2.01.04	Landing doors of the elevators shall have fire resistance as per IS:14665 (Latest edition). These doors shall also be smoke tight as far as possible.				
2.01.05	Providing metallic wire mesh/screen for counter weight guard in the elevator pit.				
3.00.00	CONSTRUCTION				
3.01.00	Construction of the elevators shall specifically meet all requirements of the codes indicated and shall have following additional features:				
	i)	Flooring of Cabin	:	Vitrified ceramic tile of matt finish.	
	ii)	Design, Construction	:	Stainless Steel (SS:304)	
	iii)	Signals	:	Car position indication in Car both visual and audio, hall position indicator at all floors, tell lights at all floors, battery operated alarm bell and emergency light and fan & telephone without handset with suitable battery, charger & controls.	
	iv)	Type of Indicators	:	Standard indicators or alternatively luminous button in car operating panel and digital hall position indicator on all floors. (All fixtures in stainless	
Anpara 'D' (2X500MW) MAIN PLANT TURNKEY PACKAGE		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION-VI, PART B		SUB-SECTION-III A-09 Crane Hoist & Service Elevators
					Page 3 of 5

Clause No.	TECHNICAL REQUIREMENTS				एनडीपीसी NTPC
				steel face plates).	
	v)	Emergency indicator	:	In case of Emergency hold-ups in between the floors, automatic flashers should indicate its location of hold-up both audio & visually as well.	
	vi)	Cabin Accessories	:	Following accessories shall be provided a) Recessed fluorescent light fittings on car floor. b) Car control station. c) Emergency stop switch. d) 5/15A , 3 pin plug socket with switch on top of lift car.	
	1. AUTOMATIC RESCUE DEVICE (ARD)-(BATTERY DRIVE): Bidder to provide a modern Advanced electronic drive system of "RESTUING Passenger Trapped in a ELEVATOR". 2. EMERGENCY SAFETY DEVICES: The lift shall be provided with safety Device attached to the lift car frame and placed beneath the car. The safety device shall be capable of stopping and sustaining the lift car up at Governor Tripping speed with full rated load in car. The level accuracy will be (+/-) 5mm with dynamic backing system.				
	3.02.00 Provide sound reducing material below machines in machine room. 3.03.00 Provide special corrosion resistant treatment on all elevator components. The protective treatment shall be subject to Employer's approval. 3.04.00 Required doors complete with door frames, hangers, tracks etc. shall be designed so as not to exceed a maximum live load of 500 Kg/M2 on the landings as specified. All steel embedment for fixing landing doors/ indicator etc. to the elevator well shaft shall be supplied by bidder. Facia plate shall be in bidder scope. 3.05.00 Guide rails complete with supporting brackets for the car and counter weights. 3.06.00 Elevator drive machines complete with electric motor, reduction gear units, suspension ropes, buffers for the cars and the counter weights and other drive and control mechanism. All foundation anchor bolts, sleeves, anchoring steel and any item required to complete the job satisfactorily shall be provided by the				
Anpara 'D' (2X500MW) MAIN PLANT TURNKEY PACKAGE		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION-VI, PART B	SUB-SECTION-IIIA-09 Crane Hoist & Service Elevators	Page 4 of 5

Clause No.	TECHNICAL REQUIREMENTS			एनडीपीसी NTPC	
	bidder. The bidder shall also provide for the grouting of anchor bolts, sleeves, anchoring steel, etc. and other anchorages.				
3.07.00	Any other steel works as well as all other accessories/components not specified in the specification but necessary for making the Elevator complete.				
3.08.00	Complete erection, testing and commissioning including all testing and commissioning materials, consumables and other tools and tackles required for erection.				
3.09.00	All minor building work including the supply of steel items, associated with installation of equipment in the machine room hoist way, hoist way door, frames and Elevator pit, shall form part of bidders scope of service, Bidder shall provide the Elevator-well complete with foundation and brick walls around the lift-well together with overhead machine room. The machine room will be provided with R.C.C. floor slab with necessary pockets for anchor bolts and slots.				
4.00.00	OPERATION				
4.01.00	Elevator shall have provisions to meet following operational requirements :				
	a) Selective Duplex collective, automatic operation with or without operation through illuminated push button station located inside the lift car. b) Power operated with automatic opening/closing car and landing doors. b) Two push buttons, one for upward movement and the other for downward movement at each intermediate landing and one push button at each terminal landing shall be provided in order to call the car. c) Push buttons shall be fixed in the car for holding the doors open for any length of the time required. d) All other safety/protection/operation interlocks as required by IS:4666 (latest edition). e) Indication for : 1) Position and call indication inside the car. 2) Up/down travel direction in car and at each landing.				
Anpara 'D' (2X500MW) MAIN PLANT TURNKEY PACKAGE		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION-VI, PART B	SUB-SECTION-IIIA-09 Crane Hoist & Service Elevators	Page 5 of 5

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
4.02.00	All equipments furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation of the equipment and for the safety of the operating persnnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions. All similar standard components/ parts of similar standard equipment provided, shall be interchangeable with one another.				
5.00.00	CODES & STANDARDS				
5.01.00	In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following : a) Bureau of Indian Standards (BIS) b) Indian Electricity Act c) Indian Electricity Rules d) Indian Explosives Act e) Indian Factories Act and State Factories Act f) Indian Boiler Regulations (IBR) g) Regulations of the Central Pollution Control Board, India h) Regulations of the Ministry of Environment & Forest (MoEF), Government of India i) Pollution Control Regulations of Department of Environment, Government of India j) U.P State Pollution Control Board.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 2 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
5.02.00	k) Any other statutory codes / standards / regulations, as may be applicable . Unless covered otherwise by Indian codes & standards and in case nothing to the contrary is specifically mentioned elsewhere in the specifications, the latest editions (as applicable as on date of bid opening), of the codes and standards given below shall also apply : a) Japanese Industrial Standards (JIS) b) American National Standards Institute (ANSI) c) American Society of Testing and Materials (ASTM) d) American Society of Mechanical Engineers (ASME) e) American Petroleum Institute (API) f) Standards of the Hydraulic Institute , U.S.A. g) International Organisation for Standardisation (ISO) h) Tubular Exchanger Manufacturer's Association (TEMA) i) American Welding Society (AWS) j) National Electrical Manufacturers Association (NEMA) k) National Fire Protection Association (NFPA) l) International Electro-Technical Commission (IEC) m) Expansion Joint Manufacturers Association (EJMA) n) Heat Exchange Institute (HEI)			
5.03.00	Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned under 5.01.00 and 5.02.00 together with			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 3 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
5.04.00	the complete word to word translation of the standard that is normally not published in English. As regards highly standardised equipments such as Steam Turbine and Generator, National /International standards such as JIS, DIN, VDI, ISO, SEL, SEW, VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment. However, for those of the above equipment not covered by these National / International standards, established and proven standards of manufacturers shall also be considered.				
5.05.00	In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern.				
5.06.00	Two (2) English language copies of all national and international codes and/or standards used in the design of the plant and equipment shall be provided by the Contractor to the Employer within two calendar months from the date of the Notification of Award.				
5.07.00	In case of any change in codes, standards & regulations between the date of bid opening and the date when vendors proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.				
5.08.00	A detailed list of standards apart from those mentioned in the respective detailed specifications in other parts of Section-VI to which all equipment/systems/civil works should conform is given in the Annexure-I to this section.				
6.00.00	EQUIPMENT FUNCTIONAL GUARANTEE				
6.01.00	The functional guarantees of the equipment under the scope of the Contract is given in Section-VI Part - A & B of Technical Specifications. These guarantees shall supplement the general functional guarantee provisions covered under Defect liabilities Section-IV, General Conditions of Contract.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 4 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
6.02.00	Liquidated damages for shortfall in meeting functional guarantee(s) during the performance and guarantee tests shall be assessed and recovered from the Contractor as specified elsewhere in this specification.				
7.00.00	DESIGN OF FACILITIES/ MAINTENANCE & AVAILABILITY CONSIDERATIONS				
7.01.00	DESIGN OF FACILITIES All the design procedures, systems and components proposed shall have already been adequately developed and shall have demonstrated good reliability under similar conditions elsewhere. The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best co-ordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical or close to the operating range of the unit.				
7.02.00	MAINTENANCE AND AVILABILITY CONSIDERATIONS Equipment/works offered shall be designed for high availability, low maintenance and ease of maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability/availability and ease of maintenance. The Bidder shall also furnish details of availability records in the reference plants stated in his experience list. Bidder shall state in his offer the various maintenance intervals, spare parts and man-hour requirement during such operation. The intervals for each type of maintenance namely inspection of the furnace, inspection of the entire hot gas path and the minor and major overhauls shall be specified in terms of fired hours , clearly defining the spare parts and man-hour requirement for each stage. Lifting devices i.e. hoists and chain pulley jacks ,etc. shall be provided by the contractor for handling of any equipment or any of its part having weight in excess of 500 Kgs during erection and maintenance activities.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI. PART-C	GENERAL TECHNICAL REQUIREMENT	Page 5 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist / crane shall be provided by the contractor for lifting the equipment and accessories covered under the specification.				
8.00.00	DOCUMENTS, DATA AND DRAWINGS TO BE FURNISHED BY CONTRACTOR				
8.01.00	Bidders may note that this is a turnkey contract. Each of the plant and equipment shall be fully integrated, engineered and designed to perform in accordance with the technical specification. All engineering and technical services required to ensure a completely engineered plant shall be provided in respect of mechanical, electrical and power systems, control & instrumentation, civil & structural works. The Contractor shall furnish engineering data in accordance with the schedule of information (Clause 8.04.00 of Part-C) as specified in Technical Data Sheets and Technical Specification.				
8.02.00	The number of copies/prints/flopy discs/CD-ROMs/manuals to be furnished for various types of document is given in Annexure-II to this Part-C, Section-VI of the Technical Specification.				
8.03.00	The documentation that shall be provided by the Contractor is indicated in the various sections of specification. This documentation shall include but not be limited to the following:				
8.03.01	A) BASIC ENGINEERING DOCUMENTATION Prior to commencement of the detailed engineering work, the Contractor shall furnish a Plant Definition Manual within 12 weeks from the date of the Notification of Award. This manual shall contain the following as a minimum : i) System description of all the mechanical, electrical, control & instrumentation & civil systems. ii) Technology scan for each system / sub-system & equipment. iii) Selection of appropriate technology / schemes for various systems/ subsystems including techno-economic studies between various options. iv) Optimisation studies including thermal cycle optimisation.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 6 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	v) Sizing criteria of all the systems, sub-systems/ equipments/ structures/ equipment foundations alongwith all calculations justifying and identifying the sizing and the design margins. vi) Schemes and Process & Instrumentation diagrams for the various systems/ sub-system with functional write-ups. vii) Water Balance diagram. viii)Operation Philosophy and the control philosophy of the Main Plant and other plants. ix) General Layout plan of the power station incorporating all facilities in Bidder's as well as those in the Employer's scope. This drawing shall also be furnished in the form of floppy discs to the Employer for engineering of areas not included in bidder's scope. x) Basic layouts and cross sections of the main plant building (various floor elevations), boiler, fuel oil area, transformer yard, switchyard and other areas included in the scope of the bidder. xi) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification. The successful bidder shall furnish within three (3) weeks from the date of Notification of Award, a list of contents of the Plant Definition Manual (PDMs) including techno-economic studies, which shall then be mutually discussed & finalised with the Employer. B) DETAILED ENGINEERING DOCUMENTS i) General layout plan of the station. ii) Layouts, general arrangements, elevations and cross-sections drawings for all the equipment and facilities of the plant. iii) Flow diagrams, Process & Instrumentation Diagrams iv) Piping isometric, composite layout and fabrication drawings. v) Piping engineering diagrams, pipe and fittings schedules, valve schedules, hanger and support schedules, insulation schedules.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 7 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	vi) Purchase specifications/ technical data sheets for all bought out and manufactured items. Contractor shall use the NTPC specifications as a base for placement of orders on their subvendors. vii) Detailed design calculations for components, system, piping etc., wherever applicable including sizing calculations for all auxiliaries like mills, fans, BFPs, CEPs, Heaters/ Deaerators, Condensers, vacuum pumps etc. viii) Boiler pressure part schedule and sizing calculations. Boiler performance data and boiler design dossier. ix) Transient, hydraulic and thermal stress analysis of piping and system wherever applicable & input and output data alongwith stress analysis isometrics showing nodes.. x) Thermal cycle information (heat balance diagrams, boiler performance calculations, condenser and heat exchanger thermal calculations etc.). xi) Characteristic Curves/ Performance Correction Curves. Hydraulic & Mechanical design calculations for condensers & heaters. xii) Comprehensive list of all terminal points which interface with Employer's facilities, giving details of location, terminal pressure, temperature, fluid handled & end connection details, forces, moments etc. xiii) Power supply single line diagram, block logics, control schematics, electrical schematics, etc. xiv) Protection system diagrams and relay settings. xv) Cables schedules and interconnection diagrams.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 8 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	xvi) Cable routing plan. xvii) Instrument schedule, measuring point list, I/O list, Interconnection & wiring diagram, functional write-ups, installation drawings for field mounted instruments, logic diagrams, control schematics, wiring and tubing diagrams of panels and enclosures etc. Drawings for open loop and close loop controls (both hardware and software). Motor list and valve schedule including type of actuator etc. xviii) Alarm and annunciation/ Sequence of Event (SOE) list and alarms & trip set points. xix) Sequence and protection interlock schemes. xx) Type test reports, insulation co-ordination study report and power system stability study report. xxi) Control system configuration diagrams and card circuit diagrams and maintenance details. xxii) Detailed software manuals & source software listing. xxiii) Detailed flow chart for digital control system. xiv) Mimic diagram layout. xxv) Civil drawings for architectural works, foundations and super-structural works, civil calculation sheets including structural analysis and design alongwith output results. xxvi) Underground facilities, levelling ,sanitary, land scaping drawings. xxvii) Geotechnical investigation and site survey reports (as applicable). xxviii) Model study reports wherever applicable. xxix) Functional & guarantee test procedures and test reports. xxx) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 9 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
8.03.02	The Contractor's while sumitting the above documents/ drawings for approval/ reference as the case may be, shall mark on each copy of submission the reference letter alongwith the date vide which the submissions are made. INSTRUCTION MANUALS The Contractor shall submit to the Employer, draft Instruction Manuals for all the equipments covered under the Contract by the end of one year from the date of his acceptance of the Letter of Award. The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. After finalisation and approval of the Employer the Instruction Manuals shall be submitted as indicated in Annexure-I I. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following. A) ERECTION MANUALS The erection manuals shall be submitted atleast three (3) months prior to the commencement of erection activities of particular equipment/system. The erection manual should contain the following as a minimum. - Erection strategy. - Sequence of erection. - Erection instructions. - Critical checks and permissible deviation/tolerances. - List of tool, tackles, heavy equipments like cranes, dozers, etc. - Bill of Materials - Procedure for erection. - Procedure for initial checking after erection. - Procedure for testing and acceptance norms.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 10 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	j) Procedure / Check list for pre-commissioning activities. k) Procedure / Check list for commissioning of the system. l) Safety precautions to be followed in electrical supply distribution during erection B) OPERATION & MAINTENANCE MANUALS i) The operating and maintenance instructions together with drawings (other than shop drawings) of the equipment, as completed, shall be in sufficient detail to enable the Employer to operate, maintain, dismantle, reassemble and adjust all parts of the equipment. They shall give a step by step procedure for all operations likely to be carried out during the life of the plant/ equipment including, operation, maintenance, dismantling and repair. Each manual shall also include a complete set of drawings together with performance/rating curves of the equipment and test certificates wherever applicable. The contract shall not be considered to be completed for purposes for taking over until these manuals have been supplied to the Employer. ii) If after the commissioning and initial operation of the plant, the manuals require any modification/ additions/ changes, the same shall be incorporated and the updated final instruction manuals shall be submitted to the Employer for records. iii) A separate section of the manual shall be for each size/ type of equipment and shall contain a detailed description of construction and operation, together with all relevant pamphlets and drawings. iv) The manuals shall include the following a) List of spare parts along with their drawing and catalogues and procedure for ordering spares. b) Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 11 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	c) Where applicable, fault location charts shall be included to facilitate finding the cause of maloperation or break down. v) Detailed specifications for all the consumables including lubricant oils, greases, chemicals etc. required for the complete plant. vi) On completion of erection, a complete list of bearings / equipment giving their location, and identification marks etc. shall also be furnished to the Employer.				
8.03.03	PLANT HANDBOOK AND PROJECT COMPLETION REPORT				
8.03.03.01	PLANT HANDBOOK The Contractor shall submit to the Employer a preliminary plant hand book preferably in A-4 size sheets which shall contain the design and performance data of various plants, equipments and systems covering the complete project including i) Design and performance data. ii) Process & Instrumentation diagrams. iii) Single line diagrams. iv) Sequence & Protection Interlock Schemes. v) Alarm and trip values. vi) Performance Curves. vii) General layout plan and layout of main plant building and auxiliary buildings viii) Important Do's & Don't's The plant handbook shall be submitted within twelve (12) months from the date of award of contract. After the incorporation of Employer's comments, the final plant handbook complete in all respects shall be submitted three (3) months before start-up and commissioning activities.				
8.03.03.02	PROJECT COMPLETION REPORT				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 12 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
8.03.04	The Contractor shall submit a Project Completion Report at the time of handing over the plant. DRAWINGS a) i) All the plant layouts shall be made in computerised 3D modelling system. The Employer reserves the right to review the 3D model at different stages during the progress of engineering. The layout drawings submitted for Employer's review shall be fully dimensioned and extracted from 3D model after interference check. a) ii) All documents submitted by the Contractor for Employer's review shall be in electronic form (soft copies) along with the desired number of hard copies as per Annexure-II of Part-C. The soft copies to be supplied shall be either in CDs, Floppies or through direct transfer via E-mail, etc. The drawings submitted for approval could be in the image form. a) iii) Final copies of the approved drawings shall be submitted in vector form on CD-ROM along with the requisite number of hard copies as per Annexure-II of Part-C. a) iv) The completed plant documentation including integrated 3-D model with equipment drawings, data sheets, P&ID, BOQ, schematics, logic diagrams, test reports and quality plan, etc. attached to the respective equipments / systems in the 3D model shall be furnished to Employer, along with the design review software which shall include interference check and walk-through animation, loaded on suitable hardware (server and work station). The software shall include facility for obtaining hard copies of all the drawings / documents on standard plotter / printer. The requisite hardware and software shall be supplied and commissioned by the Contractor at Employer's Engineering Office Complex at Noida as per mutually agreed schedule. b) All documents/text information shall be in MS Office 97 or Page maker 6.5 file.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 13 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	c) All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail indicating the type, size, arrangement, weight of each component for packing and shipment, the external connection, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the drawing schedules. d) Each drawing submitted by the Contractor (including those of subvendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units. e) The drawings submitted by the Contractor (or their subvendors) shall bear Employer's drawing number in addition to contractor's (their sub-vendor's) own drawing number. Employer's drawing numbering system shall be made available to the successful bidder so as to enable him to assign Employer's drawing numbers to the drawings to be submitted by him during the course of execution of the Contract. The Contractor shall also furnish a "Master Drawing List" which shall be a comprehensive list of all drawings/ documents/ calculations envisaged to be furnished by him during the detailed engineering to the Employer. Such list should clearly indicate the purpose of submission of these drawings i.e. "FOR APPROVAL" or "FOR INFORMATION ONLY". Similarly, all the drawings/ documents submitted by the Contractor during detailed engineering stage shall be stamped "FOR APPROVAL" or "FOR INFORMATION" prior to submission. f) The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the time schedule for the project . The review of these documents/ data/ drawings by the			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 14 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	Employer will cover only general conformance of the data/ drawings/ documents to the specifications and contract, interfaces with the equipments provided by others and external connections & dimensions which might affect plant layout. The review by the Employer should not be construed to be a thorough review of all dimensions, quantities and details of the equipments, materials any devices or items indicated or the accuracy of the information submitted. The review and/ or approval by the Employer/ Project Manager shall not relieve the Contractor of any of his responsibilities and liabilities under this contract. g) After the approval of the drawings, further work by the Contractor shall be in strict accordance with these approved drawings and no deviation shall be permitted without the written approval of the Employer. h) All manufacturing, fabrication and execution of work in connection with the equipment / system, prior to the approval of the drawings, shall be at the Contractor's risk. The Contractor is expected not to make any changes in the design of the equipment /system, once they are approved by the Employer. However, if some changes are necessitated in the design of the equipment/system at a later date, the Contractor may do so, but such changes shall promptly be brought to the notice of the Employer indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification. i) Drawings shall include all installations and detailed piping layout drawings. Layout drawings for all piping of 100 mm 65 mm and larger diameter shall be submitted for review/ approval of Employer prior to erection. Small diameter pipes shall however be routed as per site conditions in consultation with site authority/ representative of Employer based on requirements of such piping indicated in approved/ finalised FLOW Scheme/ Process & Instrumentation Diagrams and/or the requirements cropping up for draining & venting of larger diameter piping or otherwise after their erection as per actual physical condition for the entire scope of work of this turnkey package.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 15 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	Assessing & anticipating the requirement and supply of all piping and equipment shall be done by the contractor well in advance so as not to hinder the progress of piping & equipment erection, subsequent system charging and its effective draining & venting arrangement as per site suitability. j) As Built Drawings After final acceptance of individual equipment / system by the Employer, the Contractor will update all original drawings and documents for the equipment / system to “as built” conditions. k) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to Engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission. The contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data/ drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same. l) The Contractor shall submit adequate prints of drawing / data / document for Employer's review and approval. The Employer shall review the drawings and return one (1) copy to the Contractor authorizing either to proceed with manufacture or fabrication, or marked to show changes desired. When changes are required, drawings shall be re-submitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in the contract schedule. m) All engineering data submitted by the Contractor after final process including review and approval by the Project Manager/ Employer shall form part of the contract documents and the entire works covered under these specification shall be performed in strict				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 16 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
8.04.00	conformity with technical specifications unless otherwise expressly requested by the Project Manager in writing. ENGINEERING INFORMATION SUBMISSION SCHEDULE Prior to the award of Contract, a Detailed Engineering Information Submission Schedule shall be tied up with the Employer. For this, the bidder shall furnish a detailed list of engineering information alongwith the proposed submission schedule. This list would be a comprehensive one including all engineering data / drawings / information for all bought out items and manufactured items. The information shall be categorised into the following parts. i) Information that shall be submitted for the approval to the Employer before proceeding further, and ii) Information that would be submitted for Employer's information only. The Engineering Information Schedule shall be prepared monthwise. The schedule should allow adequate time for proper review and incorporation of changes/ modifications, if any, to meet the contract without affecting the equipment delivery schedule and overall project schedule. The early submission of drawings and data is as important as the manufacture and delivery of equipment and hardware and this shall be duly considered while determining the overall performance and progress.			
	ENGINEERING PROGRESS AND EXCEPTION REPORT The Contractor shall submit every month an Engineering progress and Exception Report giving the status of each engineering information including a) A list of drawings/engineering information which remains unapproved for more than four (4) weeks after the date of first submission b) Drawings which were not submitted as per agreed schedule.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 17 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
8.05.02	The draft format for this report shall be furnished to the Employer within four (4) weeks of the award of the contract, which shall then be discussed and finalised with the Employer.			
9.00.00	TECHNICAL CO-ORDINATION MEETING			
9.01.00	The Contractor shall be called upon to organise and attend monthly Design/ Technical Co-ordination Meetings(TCMs) with the Employer/Employer's representatives and other Contractors of the Employer during the period of contract. The Contractor shall attend such meetings at his own cost at Lucknow/Anpara or at mutually agreed venue as and when required and fully co-operate with such persons and agencies involved during the discussions.			
9.02.00	The Contractor should note that Time is the essence of the contract . In order to expedite the early completion of engineering activities, the Contractor shall submit all drawings as per the agreed Engineering Information Submission Schedule.The drawings submitted by the Contractor will be reviewed by the Employer as far as practicable within three (3) weeks from the date of receipt of the drawing .The comments of the Employer shall then be discussed across the table during the above Technical Co-ordination Meeting (s) wherein best efforts shall be made by both sides to ensure the approval of the drawing.			
9.02.01	The Contractor shall ensure availability of the concerned experts / consultants/ personnel who are empowered to take necessary decisions during these meetings. The Contractor shall be equipped with necessary tools and facilities so that the drawings/documents can be resubmitted after incorporating necessary changes and approved during the meeting itself.			
9.02.02	Should any drawing remain unapproved for more than six (6) weeks after it's first submission ,this shall be brought out in the monthly Engineering Progress and Exception Report with reasons thereof.			
9.03.0	Any delays arising out of failure by the Contractor to incorporate Employer's comments and resubmit the same during the TCM shall be considered as a default and in no case shall entitle the Contractor to alter the Contract completion date.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI. PART-C	GENERAL TECHNICAL REQUIREMENT Page 18 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
10.00.00	DESIGN IMPROVEMENTS The Employer or the Contractor may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly. If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any changing the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.				
11.00.00	EQUIPMENT BASES A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base, unless otherwise specifically agreed to by the Employer. Each base plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.				
12.00.00	PROTECTIVE GUARDS Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards shall be designed for easy installation and removal for maintenance purpose.				
13.00.00	LUBRICANTS, SERVO FLUIDS AND CHEMICALS				
13.01.00	The Bidder's scope includes all the first fill and one year's topping, requirements of consumables such as oils, lubricants, servo fluids, gases essential chemicals etc. Consumption of all these consumables during the initial operation and final filling after the initial operation shall also be included in the scope of the Bidder. Bidder shall also supply a quantity not less than 10% of the full charge of each variety of lubricants, servo fluids, gases, chemicals etc. used which is expected to be utilised during the first year of operation. This additional quantity shall be supplied in separate Containers.				
13.02.00	As far as possible lubricants marketed by the Indian Oil Corporation shall be used. The variety of lubricants shall be kept to a minimum possible.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 19 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals etc. required for the complete plant covered herein shall be furnished. On completion of erection, a complete list of bearings/ equipment giving their location and identification marks shall be furnished to the Employer alongwith lubrication requirements.				
14.00.00	LUBRICATION				
14.01.00	Equipment shall be lubricated by systems designed for continuous operation. Lubricant level indicators shall be furnished and marked to indicate proper levels under both standstill and operating conditions.				
15.00.00	MATERIAL OF CONSTRUCTION				
15.01.00	All materials used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilised for various components shall be those which have established themselves for use in such applications.				
16.00.00	RATING PLATES, NAME PLATES & LABELS				
16.01.00	Each main and auxiliary item of plant shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer's name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.				
16.02.00	Each item of plant shall be provided with nameplate or label designating the service of the particular equipment. The inscriptions shall be approved by the Employer or as detailed in appropriate section of the technical specifications.				
16.03.00	Such nameplates or labels shall be of white nonhygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back.				
16.04.00	Items of plant such as valves, which are subject to handling, shall be provided with an engraved chromium plated nameplate or label with engraving filled with enamel. The name plates for valves shall be marked				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI. PART-C	GENERAL TECHNICAL REQUIREMENT	Page 20 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
16.05.00 16.06.00 16.07.00 16.08.00 17.00.00	in accordance with MSS standard SP-25 and ANSI B 16.34 as a minimum. Hanger/ support numbers shall be marked on all pipe supports, anchors, hangers, snubbers and restraint assemblies. Each constant and variable spring support shall also have stamped upon it the designed hot and cold load which it is intended to support. Valves, steam traps and strainers shall be identified by Employer's tag number of a metal tap permanently attached to non pressure parts such as the yoke by a stainless steel wire. Safety and relief valves shall be provided with the following: - Manufacturer's identification. - Nominal inlet and outlet sizes in mm. - Set pressure in Kg/cm² (abs). - Blowdown and accumulation as percentage of set pressure. - Certified capacity in Kg of saturated steam per hour or in case of liquid certified capacity in litres of water per minute. All such plates, instruction plates, etc. shall be bilingual with Hindi inscription first, followed by English. Alternatively, two separate plates one with Hindi and the other with English inscriptions may be provided. 16.09.00 All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system TOOLS AND TACKLES The Contractor shall supply with the equipment one complete set of all special tools and tackles and other instruments required and other instruments for the erection, assembly, disassembly and proper maintenance of the plant and equipment and systems (including software). These special tools will also include special material handling equipment, jigs and fixtures for maintenance and calibration / readjustment, checking and measurement aids etc. A list of such tools and tackles shall be submitted by the Bidder alongwith the offer.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 21 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	The price of each tool / tackle shall be deemed to have been included in the total bid price. These tools and tackles shall be separately packed and sent to site. The Contractor shall also ensure that these tools and tackles are not used by him during erection, commissioning and initial operation. For this period the Contractor should bring his own tools and tackles. In case these tools and tackles are used by the Contractor during erection, commissioning or initial operation the same shall be refurbished repaired/replaced as required to the satisfaction of the Employer before handing over to the Employer. All the tools and tackles shall be of reputed make acceptable to the Employer.				
18.00.00	WELDING				
18.01.00	If the manufacturer has special requirements relating to the welding procedures for welds at the terminals of the equipments to be per formed by others the requirements shall be submitted to the Employer in advance of commencement of erection work.				
19.00.00	COLOUR CODE FOR ALL EQUIPMENTS/ PIPINGS/ PIPE SERVICES				
19.01.00	All equipment/ piping/ pipe services are to be painted by the Contractor in accordance with Employer's standard colour coding scheme, which will be furnished to the Contractor during detailed engineering stage.				
20.00.00	PROTECTION AND PRESERVATIVE SHOP COATING				
20.01.00	PROTECTION				
	All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either metallic or a nonmetallic protection device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather, should also be properly treated and protected in a suitable manner. All primers/paints/coatings shall take into account the hot humid, corrosive & alkaline, subsoil or overground environment as the case may be.				
20.02.00	PRESERVATIVE SHOP COATING				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 22 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted with atleast two coats of primer. Transformers and other electrical equipments, if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.			
20.03.00	Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.			
20.04.00	All other steel surfaces which are not to be painted shall be coated with suitable dust preventive compound subject to the approval of the Employer.			
20.05.00	All piping shall be cleaned after shop assembly by shot blasting or other means approved by the Employer. Lube oil piping or carbon steel shall be pickled.			
20.06.00	Painting for Civil structures shall be done as specified in Part - B of Technical Specification (Section-VI).			
21.00.00	QUALITY ASSURANCE PROGRAMME			
21.01.00	To ensure that the equipment and services under the scope of contract whether manufactured or performed within the Contractor's works or at his sub-contractor's premises or at the Employer's site or at any other place of work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Employer/authorised			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 23 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	representative after discussions before the award of the contract. The QA programme shall be generally in line with ISO-9001/IS-14001. A quality assurance programme of the contractor shall generally cover the following: a) His organisation structure for the management and implementation of the proposed quality assurance programme b) Quality System Manual c) Design Control System d) Documentation Control System e) Qualification data for Bidder's key Personnel. f) The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc. g) System for shop manufacturing and site erection control including process controls and fabrication and assembly controls. h) Control of non-conforming items and system for corrective actions. i) Inspection and test procedure both for manufacture and field activities. j) Control of calibration and testing of measuring testing equipments. k) System for Quality Audits. l) System for indication and appraisal of inspection status. m) System for authorising release of manufactured product to the Employer. n) System for handling storage and delivery. o) System for maintenance of records, and p) Furnishing of quality plans for manufacturing and field activities			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 24 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per formats No.9300-QS-01-QAI-P-09/F1 and 9300-QS-01-QAI-P-09/F2 enclosed as Annexure-III and Annexure-IV respectively.				
22.00.00	GENERAL REQUIREMENTS - QUALITY ASSURANCE				
22.01.00	All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the contractor for some of the major items is given in the respective technical specification. This is, however, not intended to form a comprehensive programme as it is the contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalisation of such quality plans will be finalised before award.				
22.02.00	Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's Quality Control Organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing. The Quality Plan shall be submitted on electronic media e.g. floppy or E-mail for review. Once the same is finalised, hard copies shall be submitted for approval. After approval the same shall be submitted in compiled form on CD ROM.				
22.03.00	Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's site Quality Control Organisation, during various stages of site activities from receipt of materials/equipment at site.				
22.04.00	The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans alongwith Quality Plans. These Quality Plans and reference documents/standards etc. will be subject to Employer's				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI. PART-C	GENERAL TECHNICAL REQUIREMENT	Page 25 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	approval without which manufacture shall not proceed. These approved documents shall form a part of the contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Employer/Authorised representative in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer alongwith technical justification for approval and dispositioning. 22.05.00 The contractor shall submit to the Employer field welding schedule for field welding activities in the format No. 9300-QS-01-CQA-W-09/F1 enclosed as Annexure-V. The field welding schedule shall be submitted to the Employer alongwith all supporting procedures, like welding procedures, heat treatment procedures, NDT procedures etc. atleast ninety days before schedule start of erection work at site. 22.06.00 No material shall be despatched from the manufacturer's works before the same is accepted subsequent to predespatch final inspection including verification of records of all previous tests/inspections by Employer's Project Manager/Authorised representative and duly authorised for despatch issuance of MDCC. 22.07.00 All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties, chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details. 22.08.00 All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the Employer. All welding/brazing procedures shall be submitted to the Employer or its authorised representative for approval prior to carrying out the welding/brazing. 22.09.00 All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his sub-contractor's works or at site or			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 26 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	elsewhere shall be qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer. 22.10.00 Test results or qualification tests and specimen testing shall be furnished to the Employer for approval. However, where required by the Employer, tests shall be conducted in presence of Employer/authorised representative. 22.11.00 For all pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. Similarly, any other statutory requirements for the equipments/systems shall also be complied with. 22.12.00 All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes. 22.13.00 No welding shall be carried out on cast iron components for repair. 22.14.00 Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only. 22.15.00 All non-destructive examination shall be performed in accordance with written procedures as per International Standards, The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job. 22.16.00 Contractor shall list out all major items /equipments / components to be manufactured in house as well as procured from sub-contractors (BOI). All the sub-vendors proposed by the Contractor for procurement of major bought out items including castings, forging, semi-finished and finished components/equipment, list of which shall be drawn up by the Contractor and finalised with the Employer shall be subject to Employer's approval. The contractor's proposal shall include vendor's facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. alongwith his own technical evaluation and shall be submitted to the Employer for approval prior to any procurement. Such vendor approval shall not relieve the contractor			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 27 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
22.17.00	from any obligation, duty or responsibility under the contract. For components/equipment procured by the contractors for the purpose of the contract, after obtaining the written approval of the Employer, the contractor's purchase specifications and inquiries shall call for quality plans to be submitted by the suppliers alongwith their proposals. The quality plans called for from the vendors shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc. Such quality plans of the successful vendors shall be finalised with the Employer and such approved Quality Plans shall form a part of the purchase order/contract between the Contractor and Vendor. Within three weeks of the release of the purchase orders/contracts for such bought out items/components, a copy of the same without price details but together with the detailed purchase specifications, quality plans and delivery conditions shall be furnished to the Employer by the Contractor.				
22.18.00	Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their subvendor's quality management and control activities. The contractor shall provide all necessary assistance to enable the Employer carry out such audit and surveillance.				
22.19.00	The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his sub-contractor's and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. He shall carry out all tests/inspection required to establish that the items/equipments conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.				
22.20.00	Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 28 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.			
22.21.00	For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.			
22.22.00	Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.			
23.00.00	QUALITY ASSURANCE DOCUMENTS			
23.01.00	The Contractor shall be required to submit two hard copies and two sets on CD ROM of the following Quality Assurance documents within three weeks after despatch of the equipment. a) Material mill test reports on components as specified by the specification and approved Quality Plans. b) The inspection plan with verification, inspection plan check points, verification sketches, if used and methods used to verify that the inspection and testing points in the inspection plan were performed satisfactorily. c) Sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment. d) Non-destructive examination results reports including radiography interpretation reports. e) Factory test results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans. f) Inspection reports duly signed by QA personnel of the Employer and Contractor for the agreed Customer Hold Points. g) During the course of inspection, the following will also be recorded: i. When some important repair work is involved to make the job acceptable, and ii. The repair work remain part of the accepted product Quality.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 29 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	h) All the accepted deviation shall be included with complete technical details.				
24.00.00	PROJECT MANAGER’S SUPERVISION				
24.01.00	To eliminate delays and avoid disputes and litigation, it is agreed between the parties to the Contract that all matters and questions shall be referred to the Project Manager and without prejudice to the provisions of ‘Arbitration’ clause in Section GCC, Section-IV, the Contractor shall proceed to comply with the Project Manager’s decision.				
24.02.00	The work shall be performed under the supervision of the Project Manager. The scope of the duties of the Project Manager pursuant to the Contract, will include but not be limited to the following: a) Interpretation of all the terms and conditions of these documents and specifications: b) Review and interpretation of all the Contractor’s drawing, engineering data, etc: c) Witness or his authorised representative to witness tests and trials either at the manufacturer’s works or at site, or at any place where work is performed under the contract : d) Inspect, accept or reject any equipment, material and work under the contract : e) Issue certificate of acceptance and/or progressive payment and final payment certificates : f) Review and suggest modifications and improvement in completion schedules from time to time : and g) Supervise Quality Assurance Programme implementation at all stages of the works.				
25.00.00	INSPECTION, TESTING AND INSPECTION CERTIFICATES				
25.01.00	The word ‘Inspector’ shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI. PART-C	GENERAL TECHNICAL REQUIREMENT	Page 30 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
25.02.00	The Project Manager, his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.				
25.03.00	The Contractor shall give the Project Manager/ Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/ Inspector, unless the witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the inspector duly certified copies of test reports in two (2) copies.				
25.04.00	The Project Manager or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.				
25.05.00	When the factory tests have been completed at the Contractor's or sub-contractor's works, the Project Manager/Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager/Inspector, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager/Inspector. Project Manager/Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests, or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 31 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
25.06.00	In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager/Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorised representative to accomplish testing.				
25.07.00	The inspection by Project Manager and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.				
25.08.00	To facilitate advance planning of inspection in addition to giving inspection notice as per Clause 25.03.00, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.				
25.09.00	All inspection, measuring and test equipments used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by Employer. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipments in the presence of Project Manager.				
25.10.00	Associated document Manufacturing Quality Plan Format no. : 9300-QS-01-QAI-P-09/F1 (Annexure-III) Field Quality Plan Format no. : 9300-QS-01-QAI-P-09/F2 (Annexure-IV) Field Welding Schedule Format no. : 9300-QS-01-CQA-W-09/F1 (Annexure-V)				
26.00.00	PRE-COMMISSIONING AND COMMISSIONING FACILITIES				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI. PART-C	GENERAL TECHNICAL REQUIREMENT	Page 32 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
26.01.00	(a) As soon as the facilities or part thereof has been completed operationally and structurally and before start-up, each item of the equipment and systems forming part of facilities shall be thoroughly cleaned and then inspected jointly by the Employer and the Contractor for correctness of and completeness of facility or part thereof and acceptability for initial pre-commissioning tests, commissioning and start-up at Site. The list of pre-commissioning tests to be performed shall be as mutually agreed and included in the Contractor's quality assurance programme as well as those included in Clause No. 36.00.00 of Part-D, Section-VI and elsewhere in the Technical Specifications. (b) The Contractor's pre-commissioning/ commissioning/start-up engineers, specially identified as far as possible, shall be responsible for carrying out all the pre-commissioning tests at Site. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the commissioning of the complete facilities shall be commenced during which period the complete facilities, equipments shall be operated integral with sub-systems and supporting equipment as a complete plant. (c) All piping system shall be flushed, steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures to accomplish this work shall be submitted for approval to the Employer six months prior to the respective implementations. The Employer will approve final verification of cleanliness. (d) The time consumed in the inspection and checking of the units shall be considered as a part of the erection and installation period. (e) The check outs during the pre - commissioning period should be programmed to follow the construction completion schedule. Each equipment/system, as it is completed in construction and turned over to Employer's commissioning (start-up) Engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed schedule to be agreed by Employer. (f) The Contractor during initial operation and performance testing shall conduct vibration testing to determine the 'base line' of performance of all plant rotating equipment. These tests shall be				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 33 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
26.02.00	conducted when the equipment is running at the base load, peak load as well as lowest sustained operating condition as far as practicable. Initial Operation a) On completion of all pre-commissioning activities/ tests and as a part of commissioning the complete facilities shall be put on 'Initial Operation' during which period all necessary adjustments shall be made while operating over the full load range enabling the facilities to be made ready for the Guarantee Tests. b) The 'Initial Operation' of the complete facility as an integral unit shall be conducted for 720 continuous hours. During the period of initial operation of 720 hours, the unit shall operate continuously at full rated load for a period not less than 72 hours. During the above period of initial operation the unit shall generate a minimum of 342 million KW Hrs*, as measured at generator terminals. The Initial Operation shall be considered successful, provided that each item/ part of the facility can operate continuously at the specified operating characteristics, for the period of Initial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility. The Contractor shall intimate the Employer about the commencement of initial operation and shall furnish adequate notice to the Employer in this respect. c) Any loss of generation due to constraints attributable to the Employer shall be construed as Deemed Generation. In case the generation loss on account of Deemed Generation is more than 18 million KW Hrs., the duration of the test shall be extended accordingly. (d) An Initial Operation report comprising of observations and recordings of various parameters to be measured in respect of the above Initial Operation shall be prepared by the Contractor. This report, besides recording the details of the various observations during initial operation shall also include the dates of start and finish of the Initial Operation and shall be signed by the			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 34 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
26.03.00	representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the Initial Operation. Based on the observations, necessary modifications/repairs to the plant shall be carried out by the Contractor to the full satisfaction of the Employer to enable the latter to accord permission to carry out the Guarantee tests on the facilities. However, minor defects which do not endanger the safe operation of the equipment, shall not be considered as reasons for with- holding the aforesaid permission. * Shall be appropriately adjusted for any generation loss attributable to the Employer. Guarantee Tests a) The final test as to prove the Functional Guarantees shall be conducted at Site by the Contractor in presence of the Employer. The contractor's Commissioning, start-up and initial operation shall make the unit ready to conduct such test. Such test will be commenced, within a period of <u>three (3) months</u> after the successful completion of Initial Operations. Any extension of time beyond the above <u>three (3) months</u> shall be mutually agreed upon. b) These tests shall be binding on both the parties of the Contract to determine compliance of the equipment with the functional guarantee. c) For performance/ demonstration tests instrumentations, of accuracy class, to the approval of the Employer shall be used. The numbers and location of the instruments shall be as per the specified test codes. In addition the values of parameters shall be logged from the information system provided under Employer's Distributed Digital Control Monitoring and Information system. Test will be conducted at specified load points. d) Any special equipment, tools and tackles required for the successful completion of the Guarantee Tests shall be provided by the Contractor, free of cost. e) The Guarantee tests and specific tests to be conducted on equipments have been brought out in detail in Sub-section V, Part A, Section-VI.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 35 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
27.00.00	TAKING OVER Upon successful completion of Initial Operations and all the tests conducted to the Employer's satisfaction, the Employer shall issue to the Contractor a Taking over Certificate as a proof of the final acceptance of the equipment. Such certificate shall not unreasonably be with held nor will the Employer delay the issuance thereof, or account of minor omissions or defects which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate.				
28.00.00	TRAINING OF EMPLOYER'S PERSONNEL				
28.01.00	In addition to the requirements given in Section General Condition of contract (GCC), Section-IV regarding training of Employer's personnel, the following shall also apply. The scope of service under training of Customer's engineers shall necessarily include, training of upto twelve (12) Employer's personnel for the power plant in the areas of Operation & Maintenance. Such training should cover a minimum period of 12 man months or as required to enable these personnel to individually take the responsibility of operating and maintaining the power station in a manner acceptable to the Contractor and Employer so that the operation and maintenance phase of the project can be carried out to ensure sustained guaranteed performance of the equal availability of the units as offered.				
28.02.00	The Bidder shall also provide training to Employer's personnel to meet operational and maintenance requirements of various C&I systems/equipment supplied under this package. This shall include training in the following areas as a minimum: a) Training for DDCMIS as per Specified in Sub-section I2, Part -B of specifications (Section-VI). b) Training for other SG/ TG/ Related C&I System / equipment. c) Training for UPS systems Annunciation system, SWAS, PA system and flue gas analysers. d) Training for special packages for various PC based systems specified under Sub-sections I 1 to I 13, Part - B of Technical Specifications, Section-VI. The exact details, extent and schedule for training shall be as finalised during detailed engineering and shall be subject to Employer's approval.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 36 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
28.03.00	The bidder shall also provide training to Employer's engineering personnel for the various equipments supplied under this package. This shall include training in the following areas as the minimum: - Training on product design features and product design softwares of the major equipments and systems. - Training on operating features of new/ latest equipments. - Exposure to various kinds of problems which may be encountered in fabrication, manufacturing, erection, welding, etc. - Exposure to codification system adopted by bidder in producing engineering documents.				
28.04.00	Contractor shall also arrange for training of Employer's personnel in respect of fire detection and protection systems as listed out in Part B, Section-VI in the Technical specifications.				
28.05.00	In all the above cases, wherever the training of Employer's personnel is arranged at the works of the manufacturers, it shall be noted that the lodging and boarding of the Employer's personnel shall be at the cost of bidder. The bidder shall make all necessary arrangements towards the same.				
29.00.00	SAFETY ASPECTS DURING CONSTRUCTION AND ERECTION In addition to the requirements given in Erection Conditions of Contract (ECC) the following shall also cover: - Working platforms should be fenced and shall have means of access. - Single core electrical cables shall not be used. Only 3 Core cable for single phase supply and 4 Core for 3 phase supply shall be used. - Ladders in accordance with Employer's safety rules for construction and erection shall be used. Rungs shall not be welded on columns. All the stairs shall be provided with handrails immediately after its erection.				
30.00.00	NOISE LEVEL The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment/ machine, furnished and installed under these specifications, expressed				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 37 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
31.00.00	in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA except for i) Safety valves and associated vent pipes for which it shall not exceed 105 dBA ii) Regulating drain valves in which case it shall be limited to 90 dBA. iii) TG unit in which case it shall not exceed 90 dBA. PACKAGING AND TRANSPORTATION All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. The Contractor shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting despatch of equipment. Before despatch it shall be ensured that complete processing and manufacturing of the components is carried out at shop, only restricted by transport limitation, in order to ensure that site works like grinding, welding, cutting & preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before despatch of materials for transportation.			
32.00.00	ELECTRICAL EQUIPMENTS			
32.01.00	All electrical equipments and devices, including insulation, heating and ventilation devices shall be designed for ambient temperature of 50 degree C and a maximum relative humidity of 100%.			
33.00.00	JUNCTION BOXES The junction boxes shall be made of minimum 2 mm thick sheet steel. Gland plates shall be removable type and made of 3 mm thick sheet steel. The boxes shall be provided with detachable cover or hinged door with captive screws. Top of the box shall be arranged to slope towards the rear of the box. The box shall be hot dip galvanised and shall be provided with suitable neoprene gaskets to achieve requisite			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 38 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
34.00.00	degree of protection. Adequate spacing shall be provided to terminate the external cables. The boxes shall be suitable for mounting on various types of steel structures. The terminal blocks provided shall be of 650 V grade, rated for 10 A for control cables. Suitable numbering for terminal blocks shall be done. In case of junction box for power cable, the box shall be rated for maximum current carrying capacity. Terminal blocks shall be of one piece, Klippon RSF-1 or ELMEX CSLT-1 type with insulating barriers.				
	INSTRUMENTATION AND CONTROL				
	All instrumentation and control systems/ equipment/ devices/ components, furnished under this contract shall be in accordance with the requirements stated herein, unless otherwise specified in the detailed specifications.				
	34.01.00 All instrument scales and charts shall be calibrated and printed in metric units and shall have linear graduation. The ranges shall be selected to have the normal reading at 75% of full scale.				
	All scales and charts shall be calibrated and printed in Metric Units as follows:				
	1	Temperature	-	Degree centigrade (deg C)	
	2.	Pressure	-	Kilograms per square centimetre (Kg/cm ²). Pressure instrument shall have the unit suffixed with 'a' to indicate absolute pressure. If nothing is there, that will mean that the indicated pressure is gauge pressure.	
	3.	Draught	-	Millimetres of water column (mm wc).	
	4.	Vacuum	-	Millimeters of mercury gauge (mm Hg) or water column (mm Wcl).	
	5.	Flow (Gas)	-	Tonnes/ hour	
6.	Flow (Steam)	-	Tonnes/ hour		
7.	Flow (Liquid)	-	Tonnes / hour		
8.	Flow base	-	760 mm Hg. 15 deg.C		
9.	Density	-	Grams per cubic centimetre.		
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 39 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
34.02.00	All instruments and control devices provided on panels shall be of miniaturized design, suitable for modular flush mounting on panels with front draw out facility and flexible plan-in connection at rear.				
34.03.00	Instruments for sensing, transmission and measuring system shall be of electronic type with signal transmission in current mode of 4-20 mA DC. For interrogation of potential free contacts, 48 V DC power supply shall be employed.				
34.04.00	For sequence interlocks and equipment/ unit protection, independent and separate direct acting switches shall be provided. Indicating type process switches shall not be acceptable. Wherever blind switches are provided, separate gauges for local indication shall be provided to facilitate easy operation/ maintenance.				
34.05.00	The contacts of switch devices (process switches, limit switches) etc., shall be suitable for DDCMIS / PLC as specified. For connection to any other system, these shall be rated continuously for 5A at 240 V AC, 50 Hz (breaking inductive circuits) and 0.25 A at 220V DC. Each switching element shall be provided with two electrically independent single pole double throw (SPDT) snap acting contacts. All spare contracts of the switch devices, shall be wired to the nearest junction box/ terminal box.				
34.06.00	All electronic modules shall have gold plated connector fingers and further all input and output modules shall be short circuit proof. These shall also be tropicalised & components shall be of industrial grade or better.				
34.07.00	All equipment/ systems located in the field shall be suitable for continuous operation without loss of function, departure from specifications or damage, at the ambient temperature of 50 deg. C and relative humidity of 95%.				
34.08.00	All equipment/ systems located in air conditioned area as specified else where shall also be designed and constructed to operate for short periods of plant operation when air-conditioning equipment malfunctions (without loss of function, departure from specifications requirements or damage) at the maximum ambient temperature of 50 deg C and relative humidity of 95% RH.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 40 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
35.00.00	PROTECTION CLASS OF CABINETS / PANELS, ENCLOSURES ETC. a) All panels desks cabinets & enclosures furnished shall at least comply with the requirements of protection classes as indicated below: 1. In-door air -conditioned (A.C.) areas - IP22 2. In-door Non A.C. areas: (a) Ventilated enclosures - IP42 (b) Non- Ventilated - IP54 3. Out-door - IP55 b) Distribution boxes, junction boxes, cold junction compensation boxes, terminal boxes and all other field mounted equipment to be furnished as per this specification shall have weather protection conforming to IP 55. c) The design of panels. cabinets. enclosures and packaging density of components mounted therein shall be such that the temperature rise does not exceed 10 deg C above the ambient under the worst conditions. The Contractor shall furnish during detailed engineering the necessary design calculation for Employer's review. d) Enclosures for peripheral equipments like printers, etc. shall take care of noise and shall ensure minimum possible noise disturbance to the working personnel.			
35.01.00	Permanently fastened, stainless steel, name plate stamped with the Employer's tag number and other necessary details shall be furnished on all gauges, control valves, flow devices, switch devices, temperature elements, solenoid valves, and all other devices, panels, cabinets, enclosures, console inserts etc. after Employer's approval.			
36.00.00	ELECTRICAL NOISE CONTROL The equipment furnished by the Contractor shall incorporate necessary techniques to eliminate measurement and control problems caused by electrical noise. Areas in Contractor's equipment which are vulnerable to electrical noise shall be hardened to eliminate possible problems. Any additional equipment, services required for effectively eliminating the noise problems shall be included in the proposal. The equipment shall be			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 41 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
37.00.00	protected against ESD as per IEC-801- 2. Radio frequency interference. (RFI) and electro magnetic interference (EMI) protection against hardware damage and control system mal operations/errors shall be provided for all systems. SURGE PROTECTION FOR SOLID STATE EQUIPMENT All solid state systems /equipment shall be able to withstand the electrical noise and surge as encountered in actual service conditions and inherent in a power plant and shall meet the requirements of surge protection as defined in ANSI C37.90.1-1989 on its suitable equivalent class of IEC 254-4. Details of the features incorporated and relevant tests carried out. The test certificates. etc. shall be submitted by the Bidder. 38.00.00 INSTRUMENT AIR SYSTEM The instrument air supply system as supplied by the Bidder for various pneumatic control & instrumentation devices like pneumatic actuators, power cylinders, E/P converters, piping / tubing etc. Each pneumatic instrument shall have an individual air shut - off valve. The pressure regulating valve shall be equipped with an internal filter, a 50 mm pressure gauge and a built-in filter housing blow down valve. 38.01.00 Tapping points shall include probes, wherever applicable, for analytical measurements and sampling. For direct temperature measurement of all working media, one stub with internal threading of approved pattern shall be provided along with suitable plug and washer. The Contractor will be intimated about thread standard to be adopted. The following shall be provided on equipment by the Bidder. The standard which is to be adopted, will be intimated to the Contractor. i) Temperature test pockets with stub and thermowell ii) Pressure test pockets			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 42 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	LIST OF CODES AND STANDARDS				
	Indian Standards	Title	International and Internationally recognised standards		
	IS:277	Galvanised steel sheets (plain or corrugated)			
	IS:655	Specification for metal air duct			
	IS:800	Code of practice for use of structural steel in general building construction	BS 449:1969 BS 5950 ASA A57, 1-1952		
	IS:807	Code of practice for design, manufacture, erection and testing (Structural portion) of cranes and hoists	Draft Revision of A.S. NO. CS.2 SAA Crane and Hoist code Doc.No. BU/4 Rev 6588 (Issued by Standards Association of Australia). DIN 120:1936 (Sheet 1) DIN 120:1936 (Sheet 2) 327 part-I, 1951 BS 466 part-II, 1960 BS 644:1960 BS 1757:1951 BS 2573:part-I:1960		
	IS:875	Code of practice for design loads (other than earthquake) for buildings and structures Leading standards	National Building code of Canada (1953)-Part-IV Design section 4.1 (issued by Canadian Standard) DIN-1055-1955 (Issued by ASA)		
IS:1239 Part-I	Mild steel tubes	(ISO/R 65-1957) (ISO/R-64-1958) (ISO/R-65-1958) (BS 1387 : 1957)			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package		Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 44 of 71

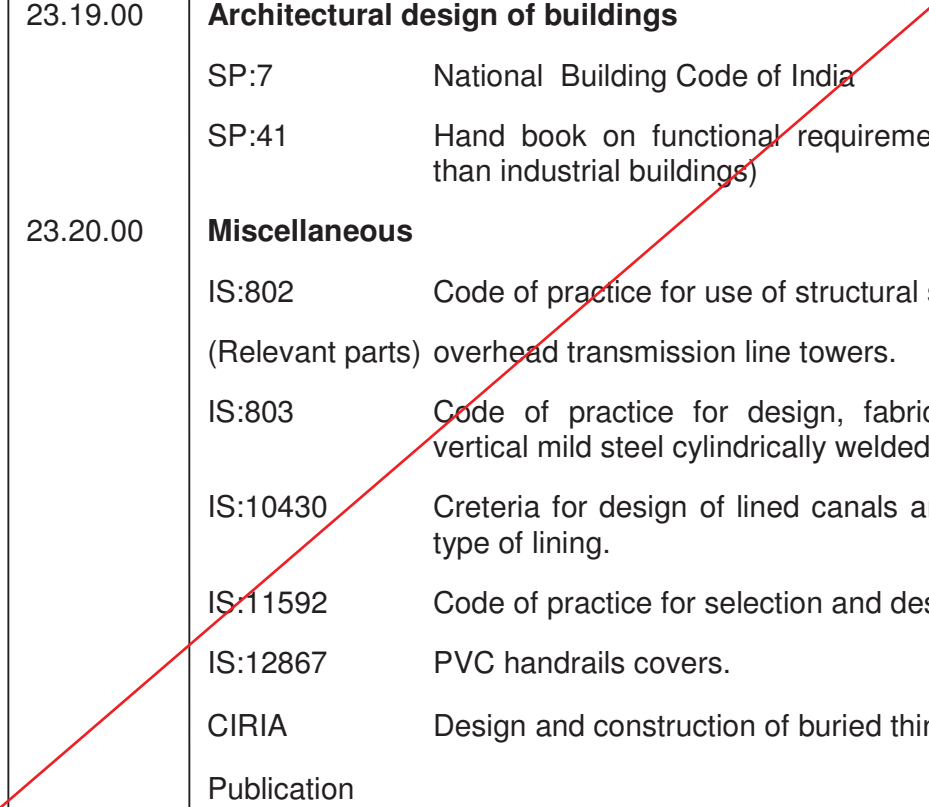
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	IS: 13311 Method of non-destructive testing of concrete. Part-1 Ultrasonic pulse velocity. Part-2 Rebound hammer. SP:23 Handbook of concrete mixes SP: 24 Explanatory Handbook on IS: 456-1978 SP: 34 Handbook on concrete reinforcement and detailing. Precast Concrete Works SP: 7(PartVI/ National Building Code- Structural design of prefabrication and Sec.7) systems building. IS: 10297 Code of practice for design and construction of floors and roofs using precast reinforced/prestressed concrete ribbed or cored slab units. IS: 10505 Code of practice for construction of floors and roofs using pre-cast reinforced concrete units. Masonry and Allied Works IS: 1905 Code of Practice for Structural Safety of Buildings-Masonry walls. IS: 2212 Code of Practice for Brickwork. IS: 2250 Code of Practice for Preparation and use of Masonry Mortar. SP: 20 Explanatory hand book on masonry code. Sheeting Works IS:277 Galvanised steel sheets (plain or corrugated). IS: 459 Unreinforced corrugated and semi-corrugated asbestos cement sheets. IS: 513 Cold-rolled carbon steel sheets. IS: 730 Specification for fixing accessories for corrugated sheet roofing. IS: 1626 Specification for Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 53 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	IS: 2527 Code of practice for fixing rain water gutters and down pipe for roof drainage. IS: 3007 Code of practice for laying of asbestos cement sheets. IS: 5913 Methods of test for asbestos cement products. IS: 7178 Technical supply conditions for tapping screw. IS: 8183 Bonded mineral wool. IS: 8869 Washers for corrugated sheet roofing. IS: 12093 Code of practice for laying and fixing of sloped roof covering using plain and corrugated galvanised steel sheets. IS: 12866 Plastic translucent sheets made from thermosetting polyester resin (glass fibre reinforced). IS: 14246 Specification for continuously pre-painted galvanised steel sheets and coils. Fabrication and Erection of Structural Steel Work IS: 2016 Specification for plain washers. IS: 814 Specification for covered Electrodes for Metal Arc Welding for weld steel. IS: 1852 Specification for Rolling and Cutting Tolerances for Hot rolled steel products. IS: 3502 Specifications for chequered plate. IS: 6911 Specification for stainless steel plate, sheet and strip. IS: 3757 Specification for high strength structural bolts IS: 6623 Specification for high strength structural nuts. IS: 6649 High Tensile friction grip washers. IS: 800 Code of practice for use of structural steel in general building construction. IS: 816 Code of practice for use of Metal Arc Welding for General Construction.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 54 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	IS: 4000	Code of practice for assembly of structural joints using high tensile friction grip fasteners.		
	IS: 9595	Code of procedure of Manual Metal Arc Welding of Mild Steel.		
	IS: 817	Code of practice for Training and Testing of Metal Arc Welders.		
	IS: 1811	Qualifying tests for Metal Arc Welders (engaged in welding structures other than pipes).		
	IS: 9178	Criteria for Design of steel bins for storage of Bulk Materials.		
	IS: 9006	Recommended Practice for Welding of Clad Steel.		
	IS: 7215	Tolerances for fabrication steel structures.		
	IS: 12843	Tolerance for erection of structural steel.		
	IS: 4353	Recommendations for submerged arc welding of mild steel and low alloy steels.		
	SP: 6 (Part 1 to 7)	ISI Hand book for structural Engineers.		
	IS: 1608	Method of Tensile Testing of Steel products other than sheets, strip, wire and tube.		
	IS: 1599	Method of Bend Tests for Steel products other than sheet, strip, wire and tube		
	IS : 228	Methods of chemical Analysis of pig iron, cast iron and plain carbon and low alloy steel.		
	IS : 2595	Code of Practice for Radio graphic testing.		
	IS : 1182	Recommended practice for Radiographic Examination of fusion welded butt joints in steel plates.		
	IS : 3664	Code of practice for Ultra sonic Testing by pulse echo method.		
	IS : 3613	Acceptance tests for wire flux combination for submerged Arc Welding.		
	IS : 3658	Code of practice for Liquid penetrant Flaw Detection.		
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 55 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	IS : 5329	Code of practice for sanitary pipe work above ground for buildings.		
	IS : 5382	Rubber sealing rings for gas mains, water mains and sewers.		
	IS : 5822	Code of practice for laying of welded steel pipes for water supply.		
	IS : 5961	Cast iron grating for drainage purpose.		
	IS : 7740	Code of practice for road gullies.		
	IS : 8931	Cast copper alloy fancy bib taps and stop valves for water services.		
	IS : 8934	Cast copper alloy fancy pillar taps for water services.		
	IS : 9762	Polyethylene floats for ball valves.		
	IS : 10446	Glossary of terms for water supply and sanitation.		
	IS : 10592	Industrial emergency showers, eye and face fountains and combination units.		
	IS : 12592	Specification for precast concrete manhole covers and frames.		
	IS : 12701	Rotational moulded polyethylene water storage tanks.		
	SP: 35	Hand book on water supply and drainage.		
	-	Manual on Sewerage and sewage treatment (Published by CPH & EEO) As updated.		
	Doors, Windows and Allied Works			
	IS : 204	Tower Bolts		
	Part-I	Ferrous metals.		
	Part-II	Nonferrous metals.		
	IS : 208	Door Handles.		
	IS : 281	Mild steel sliding door bolts for use with padlocks.		
	IS : 362	Parliament Hinges.		
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 59 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	IRC:16 Specification for priming of base course with bituminous primers. IRC:19 Standard specifications and code of practice for water bound macadam. IRC:21 Standard specifications and Code of practice for road bridges, section-III - Cement concrete (plain and reinforced). IRC:34 Recommendations for road construction in waterlogged areas. IRC:36 Recommended practice for the construction of earth embankments for road works. IRC:37 Guidelines for the Design of flexible pavements. IRC:56 Recommended practice for treatment of embankment slopes for erosion control. IRC:73 Geometric design standards for rural (non-urban) highways. IRC:86 Geometric Design standards for urban roads in plains. IRC:SP:13 Guidelines for the design of small bridges & culverts. IRC - Public- Ministry of Surface Transport (Roads Wing), Specifications ation for road and bridge works. IS:73 Specification for paving bitumen Loadings IS:875 Code of practice for design loads other than earthquake) for (Pt. I to V) buildings and structures. IS:1893 Criteria for earthquake resistant design of structures. IS:4091 Code of Practice for design and construction of foundation for transmission line towers & poles. IRC:6 Standard specifications & code of practice for road bridges, Section-II Loads and stresses. M.O.T. Deptt. of railways Bridge Rules. Safety IS:3696 Safety code for scaffolds and ladders. (Part I & II) IS:3764 Safety code for excavation work. IS:4081 Safety code for blasting and related drilling operations. IS:4130 Safety code for demolition of buildings. IS:5121 Safety code for piling and other deep foundations.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 64 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
23.19.00	IS:5916	Safety code for construction involving use of hot bituminous materials.		
	IS:7205	Safety code for erection on structural steelwork.		
	IS:7293	Safety code for working with construction machinery.		
	IS:7969	Safety code for handling and storage of building materials		
	IS:11769	Guidelines for safe use of products containing asbestos.		
-	Indian Explosives Act. 1940 as updated.			
23.19.00	Architectural design of buildings			
	SP:7	National Building Code of India		
	SP:41	Hand book on functional requirements of buildings (other than industrial buildings)		
23.20.00	Miscellaneous			
	IS:802	Code of practice for use of structural steel in (Relevant parts) overhead transmission line towers.		
	IS:803	Code of practice for design, fabrication and erection of vertical mild steel cylindrically welded in storage tanks.		
	IS:10430	Creteria for design of lined canals and liner for selection of type of lining.		
	IS:11592	Code of practice for selection and design of belt conveyors.		
	IS:12867	PVC handrails covers.		
	CIRIA	Design and construction of buried thin-wall pipes.		
	Publication			
	REFERENCE CODES AND STANDARDS FOR CONTROL AND INSTRUMENTATION			
	The design, manufacture, inspection, testing & installation of all equipment and system covered under this specification shall conform to the latest editions of codes and standards mentioned below and all other applicable VDE, IEEE, ANSI, ASME, NEC, NEMA, ISA AND Indian Standards and their equivalents.			
	Temperature Measurements			

Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 65 of 71
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	 1. Instrument and apparatus for temperature measurement - ASME PTC 19.3 (1974). 2. Temperature measurement - Thermocouples ANSI MC 96.1 - 1982. 3. Temperature measurement by electrical Resistance thermometers - IS:2806. 4. Thermometer - element - Platinum resistance - IS:2848. Pressure Measurements 1. a) Instruments and apparatus for pressure measurement - ASME PTC 19.2 (1964). b) Electronic transmitters BS:6447. 2. Bourdon tube pressure and vacuum gauges - IS:3624 - 1966. 3. Process operated switch devices (Pr. Switch) BS-6134. Flow Measurements Instruments and apparatus for flow measurements - ASME PTC 19.5 (1972) Interim supplement, Part-II. Measurement of fluid flow in closed conduits - BS-1042. Electronic Measuring Instrument & Control Hardware/ Software 1. Automatic null balancing electrical measuring instruments - ANSI C 39.4 (Rev. 1973): IS:9319. 2. Safety requirements for electrical and electronic measuring and controlling instrument - ANSI C 39.5 - 1974. 3. Compatibility of analog signals for electronic industrial process instruments - ISA - S 50.1 (1982) ANSI MC 12.1 - 1975. 4. Dynamic response testing of process control instrumentation ISA - S 26 (1968). 5. Surge Withstand Capability (SWC) tests - ANSI C 37.90 a/IEEE-472 or suitable class of IEC-255-4 equivalent to ANSI C37.90a/IEEE-472. 6. Printed circuit boards - IPC TM - 650, IEC 326 C. 7. General requirement and tests for printed wiring boards - IS 7405 (Part-I) 1973. 8. Edge socket connectors - IEC 130-11.
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2 TECHNICAL SPECIFICATIONS SECTION VI, PART-C GENERAL TECHNICAL REQUIREMENT Page 66 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	9. Requirements and methods of testing of wire wrap terminations DIN 41611 Part-2. 10. Dimensions of attachment plugs & receptacles - ANSI C 73 - 1973 (Supplement ANSI C 73 a - 1980). 11. Direct acting electrical indicating instrument - IS:1248 - 1968 (R). 12. Standard Digital Interface for Programmable Instrumentation - IEEE-488.2 - 1990. 13. Information Processing Systems - Local Area Networks - Part 2 : Logical Link Control - IEEE-802.2 - 1989. 14. Standard for Local Area Networks : Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1985. 15. Supplements A, B, C and E to Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1988. 16. Standard for Local Area Networks : Token - Passing Bus Access Method - IEEE-802.4 - 1985. 17. Standard for Local Area Networks : Token - Ring Access Method and Physical Layer Specification - IEEE-802.5 - 1985. 18. IEEE Guide to Software Requirements Specifications - IEEE-830 - 1984. 19. Hardware Testing of Digital Process Computers - ISA RP55.1 - 1983. 20. Electromagnetic Susceptibility of Process Control Instrumentation - SAMA PMC 33.1 - 1978. 21. Interface Between the Data Terminal Equipment and Data Circuit - Terminating Equipment Employing Serial Binary Data Interchange - EIA-232-D-1987. 22. Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment, Part 3 : Radiated Electromagnetic Field Requirements - IEC 801-3-1984. Instrument Switches and Contact 1. Contact rating - AC services NEMA ICS 2 - 1978 (with revision through May 1983), Part - 2-125, A6000. 2. Contact rating - DC services NEMA ICS 2-1978 Part-2 125, N600. Enclosures			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 67 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS				
	1. Type of Enclosures - NEMA ICS Part - 6 - 1978 (with Rev. 1 4/80) through 110.22 (Type 4 to 13). 2. Racks, panels and associated equipment - EIA : RS - 310 C- 1983 (ANSI C 83.9 - 1972). 3. Protection class for Enclosures, cabinets, control panels & desks - IS:2147 - 1962. Apparatus, enclosures and installation practices in hazardous area 1. Classification of hazardous area - NFPA 70 - 1984, Article 500. 2. Electrical Instruments in hazardous dust location - ISA - 512.11, 1973. 3. Intrinsically safe apparatus - NFPA 493 1978. 4. Purged and pressurised enclosure for electrical equipment in hazardous location - NFPA 496-1982. 5. Enclosures for Industrial Controls and Systems - NEMA IS 1.1 - 1977. Sampling System 1. Stainless steel material of tubing and valves for sampling system - ASTMA 296-82, Grade 7 P 316. 2. Submerged helical coil heat exchangers for sample coolers ASTM D11 92-1977. 3. Water and steam in power cycle - ASME PTC 19.11. 4. Standard methods of sampling system - ASTM D 1066-99. Annunciators 1. Specifications and guides for the use of general purpose annunciators - ISA S 19.1, 1979. 2. Surge withstand capability tests - ANSI C 37.90a - 1989/IEEE-472 or suitable class of IEC 255-4 equivalent to ANSI C37.90a 1989/IEEE-472 3. Damp heat cycling test - IS:2106 4. Specification for Electromagnetic Susceptibility - SAMA DMC 33, 1/78 Protections 1. Relays and relay system associated with electric power apparatus. ANSI C 37.90, 1 - 1989.				
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 68 of 71	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	 2. General requirements & tests for switching devices for control and auxiliary circuits including contactor relays - IS:6875 (Part-I) - 1973. 3. Turbine water damage prevention - ASME TDP-1-1980. 4. Boiler safety interlocks - NFPA Section 85 B - 1984, 85 C - 1991. UPS System 1. Practices and requirements for semi-conductor power rectifiers - ANSI C 34.2, 1973. 2. Relays and relays system associated with electrical power apparatus - ANSI C 3.90 - 1983. 3. Surge withstand capability test - ANSI C 37.90 1 -1989. 4. Performance testing of UPS - IEC 146. 5. Stationary cells & Batteries Lead Acid type (with tubular positive plates) specification IS-1651-1991. 6. Recommended practice for sizing large lead storage batteries for generating stations & sub-stations - IEEE-485-1985. 7. Printed Circuit Board - IPC TM 650, IEC 326C. 8. General Requirements & tests for printed wiring boards, IS:7405 (Part-I) 1973. Control Valves 1. Control valve sizing - Compressible & Incompressible fluids - ISA S 75.01-1985. 2. Face to face dimensions of control valves - ANSI B 16.00 - 1973. 3. ISA Hand Book of Control Valves - (ISBN : B: 1047-087664-234-2). 4. Codes for pressure piping - ANSI B 31.1 5. Control Valve leak class - ISA RP 39.6 Process Connection & Piping 1. Codes for pressure piping "power piping" - ANSI B 31.1. 2. Seamless carbon steel pipe ASTM - A - 106. 3. Forged & Rolled Alloy steel pipe flanges, forged fittings and valves and parts - ASTM - A - 182. 4. Material for socket welded fittings - ASTM - A - 105. 5. Seamless ferritic alloy steep pipe - ASTM - A - 335.
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2 TECHNICAL SPECIFICATIONS SECTION VI, PART-C GENERAL TECHNICAL REQUIREMENT Page 69 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 			
	6. Pipe fittings of wrought carbon steel and alloy steel - ASTM - A - 234. 7. Composition bronze of ounce metal castings - ASTM - B - 62. 8. Seamless Copper tube, bright annealed - ASTM - B - 168. 9. Seamless copper tube - ASTM - B - 75. 10. Dimension of fittings - ANSI - B - 16.11. 11. Valves flanged and butt welding ends - ANSI - B - 16.34. Instrument Tubing 1. Seamless carbon steel pipe - ASTM - A 106. 2. Material of socketweld fittings - ASTM - A105. 3. Dimensions of fittings - ANSI - B - 16.11. 4. Code for pressure piping, welding, hydrostatic testing - ANSI B 31.1. Cables 1. Thermocouples extension wires/cables - ANSI MC 96.1 - 1992. 2. Requirements for copper conductor-Wiring cables for telecommunications & information processing system - VDE:0815. 3. Colour coding of single or multi-pair cables - ICEA - S - 61-402 (third edition) NEMA WCS - 1979 with revisions thorough 2/83. 4. Insulation & Sheathing compounds for cables : VDE 0207 (Part-4, 5 & 6). 5. Guide design and installation of cable systems in power generating stations (insulation, jacket materials) - IEEE Std. 422-1977. 6. Rules for Testing insulated cables and flexible cables : VVDE - 0472 7. Requirements of vertical flame propagation test - IEEE 383 - 1974 (R 1980) 8. Standard specification for tinned soft or annealed copper wire for electrical purpose - ASTM B-33-81. 9. Oxygen index and temperature index test - ASTM D - 2863. 10. Smoke density measurement test - ASTM D - 2843. 11. Acid gas generation test - IEC - 754 - 1. 12. Swedish Chimney test - SEN - 4241475 (F3). 13. Teflon (FEP) insulation & sheath test - ASTM D - 2116.			
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-C	GENERAL TECHNICAL REQUIREMENT	Page 70 of 71

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
	 14. Thermocouple compensating cables - Testing requirements & sampling plan IS:8784. 15. PVC insulated electric cables for working voltage upto and including 1100 V - IS:1554 (Part-I). Cable Trays, Conduits 1. Guide for design and installation of cable systems in power generating station (Cable trays, support systems, conduits) - IEEE Std. 422, 1977, NEMA VE-1 1979, NFPA 70-1984. 2. -do- Test Standards. NEMA VE-1-1979. 3. Zinc coating "hot dip" on assembled products for galvanising of carbon steel cable trays - ASTM A - 386-78. Public Address System 1. Specifications for loud speakers - IS:7741 (Part-I, II and III) 2. Code of safety requirement for electric mains operated audio amplifiers - IS:1301 3. Specification for Public Address Amplifiers - IS:10426. 4. Code of practice for outdoor installation of PA system - IS:1982. 5. Code of practice for installation for indoor amplifying and sound distribution system - IS:1881. 6. Basic environmental testing procedures for electronic and electrical items - IS:9000. 7. Characteristics and methods of measurements for sound system equipment - IS:9302 8. Code of practice of electrical wiring installations (System voltage not exceeding 650 volts) - IS:732 9. Rigid steel conduits for electric wiring - IS:9537 (Part-I and II) 10. Fittings for rigid steel conduits for electrical wiring - IS:2667 11. Degree of protection provided by enclosure for low voltage switchgear and control gear - IS:2147. Vibration Monitoring System 1. API 670 - 1994 2. BS : 4675 Part-2
Anpara'D' TPS(2 x 500MW) Main Plant Turnkey Package	Bid Doc. No.: CS-9300-108-2 TECHNICAL SPECIFICATIONS SECTION VI, PART-C GENERAL TECHNICAL REQUIREMENT Page 71 of 71

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION C	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 1 OF 1	

SECTION C1-B

FUNCTIONAL/PERFORMANCE / DEMONSTRATION GUARANTEE (AS APPLICABLE)



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION C

SUB-SECTION

REV. 00

DATE: 07.12.2017

SHEET 2 OF 1

**TRIAL OPERATION, COMMISSIONING, PERFORMANCE/ DEMONSTRATION
GUARANTEE TESTS:**

1.0.0 General Clause:

1.1.0 Performance and other data:

- 1) Detailed data of foundations for equipments, loading data, locations. Data shall include Breaking of load on guides, reactions of buffers on lift pits, reaction on support points in Machine room, hoist way etc.
- 2) Details of block outs, embedments inserts etc.
- 3) Write-up explaining the sequence of operation of control circuits and elevator components when an operation button is pressed.

1.1.1 Contract Drawing Schedule:

- 1) General Arrangement and clearance drawings showing the general construction and dimensions of the equipment and complete structure.
- 2) Layout of the lift showing details of size and structure of lift well, plan of the machine room and lift pit.
- 3) Electrical control diagrams and detailed circuit diagrams and physical arrangement / location diagrams of various electrical components of the controller in the machine room, in the hoist way, in the car, at the landing etc.
- 4) Erection assembly drawings

2.0.0 Specific Clause:

Demonstration / Functional guarantee tests of elevator shall be carried out at site as follows

- A. Rated capacity of the elevator.
- B. Travel and hoist Speed of the elevator.
- C. Accurate positioning of the elevator.
- D. Over Load test as per IS.

	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07/12/2017
		SHEET 1 OF 1	
QUALITY ASSURANCE			

**ANNEXURE-III
QUALITY ASSURANCE PLAN**

		MANUFACTURING QUALITY PLAN FOR=M/S vendor	PROJECT: PACKAGE: ITEM: ELEVATOR BHEL REF. NO.:					Q.P/FQP. NO & REV: DATE:1 PAGE: 1of 4 JOB NO:						
1	2	3	4	5	6	7	8	9	10				11	
Sr. No.	COMPONENT& OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD	AGENCY				REMARKS	
									D	VE	M	B		
A. Boughtout Items :														
1	Raw materials, Round Hexagon & Structural. Type : EN-8/EN-8D to EN-9,B and En-24	A: Chemical Composition	Major	Analysis	Sample	IS/BS : 970	IS/BS : 970	O.S.L/ T.C		V	V	V		
		B: Mechanical Properties	Major	Hardness	Sample	IS/BS : 970	IS/BS : 970	QA REG.		V	V	V		
		C: Dimensional Checks	Major	Measurement	100%	DRG.	DRG.	D.I.R/Q.C.R		V	w	V		
2	Raw material Rounds, En-8, EN-9, EN-24	Crack Detection	Major	Ultrasonic testing	100%	ASTM-388	ASTM -388	QA/FMT/03		V	W	V		
3	Casting : a. C.I. Graded Castings	A: Chemical Composition	Major	Analysis	Sample	IS-vendor DRG	AS PER DRG.	S.T.C	√	V	V	V		
		B: Mechanical Properties	Major	Hardness on traction sheave	Sample	vendor-DRG IS : 210	vendor-DRG IS : 210	S.T.C	√	V	V	V		
		C: Dimensional Checks	Major	Measurement	Sample	vendor-DRG	vendor-DRG	QA/FMT/02		-	W	-		
		D: Blow Holes	Major	Visual	100%	—	-	QA/REG		-	W	-		
4	Suppliers Item : a. Manufactured Items	Dimensional Check	Major	Measurement	100%	vendor/DRG.	vendor/DRG.	D.I.R		-	W	-		
	b. Moldings Rubber Items (ABSORBER)	A: Dimensional Checks	Major	Measurement	100%	vendor-DRG.	vendor/DRG.	QA/FMT/02		-	W	-		
		B: Hardness	Major	Compression Test	Sample	vendor-DRG.	vendor-DRG.	QA/FMT/02		-	W	-		
	c. Springs (Buffer)	A: Dimensional Check	Major	Measurement	100%	vendor-DRG.	vendor-DRG.	QA/FMT/02		-	W	-		
		B: Spring Constant compression.	Major	Compression	Sample	vendor-DRG.	vendor-DRG.	S.T.C	√	V	V	V		
	d. Guide Rail.	A.Chemical Test.	Major	Analysis	Sample	vendor- DRG	vendor -DRG	S. T.C	√	V	V	V		
		B. Dimension check.	Major	Measurement	Sample	vendor-DRG.	vendor-DRG.	QA/FMT/02		V	W	V		
	e. Wire rope	A: Dimensional Check	Major	Measurement of O.D/ Const.	Sample	IS/2365 & IS : 2266	IS/2365 & IS : 2266	QA/FMT/02		-	W	-		
		B: Mechanical Properties.	Major	Measurement	Correlate S.T.C	IS : 2266	IS : 2266	S.T.C	√	V	V	V		
*V= Verification as appropriat. *M= Manufacturer/Sub contractor. *W=Witness , *VE= Manufacturer/ sub contractor Vendor. *S.T.C= Supplier Test Certificate, *B =BHEL/Nominated inspection agency. *O.S.L = Out Side Lab, *D.I.R=Daily inspection register. *R.Q.C = Rvendedorpt Quality Control (vendor) . *P =Perform. *Q.C.R = Qua;ity Control Register (vendor) . *T.C. = Test Certificate, *D.I.R = Daily inspection register. * D = Documents. *U.E.R. =Ultra Sonic Examination Record .			MANUFACTURER SEAL AND SIGN		CONTRACTOR SIGN AND SEAL .		NAME & SIGN OF APPROVING AUTHORITY & SEAL							

1	2	3	4	5	6	7	8	9	10				11
Sr. No.	COMPONENT& OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD	AGENCY				RMARKS
									D	VE	M	B	
	f. Power & control (PVC)cable	a- FRLS , b- Insulation resistance.	Major do	Electrical do	Sampling do	IS - 694 do	IS - 694 do	S.T.C do	√ √	V V	V V	V V	
5	Raw material for motor. (1) Enameled wire.	a) Dimension Check b) High voltage test	Major Major	Measurement Elect.	Sample One Sample each roll	vendor -STD IS:4800	vendor -STD IS:4800	D.I.R D.I.R		V V	W W	V V	
	(2) Copper base (Flat)	Chemical check	Major	Analysis	Sample	Cu=min 99.5%	Cu=min 99.5%	O.S.L / T.C		V	V	V	
6	Finished Manufactured Components	Plating thickness control	Major	Measurement	Sample	vendor-STD.	vendor-STD.	vendor-STD		V	W	V	
B. Inspection During mfg.													
1	Machine Shop :	A: Dimensional Check B: Crack detection Motor bodies C: Surface check	Major Major Major	Measurement D.P. Test Visual	100% 100% 100%	vendor-DRG. vendor-STD. vendor-STD.	vendor-DRG. vendor-STD. vendor-STD.	QA/FMT/01 - -		- - -	W W W	- - -	
2	Fabrication Shop :	Dimensional Checks of critical items Welding	Major minor	Measurement Visual	100% Sampling	vendor-DRG. do	vendor-DRG. do	Q.C.R .		- .	W W	- .	Welding by approved welder
C. Assembly Inspection.													
1	Winding gear.	A- Back lash of gears& Maching contact. B- Vibration . C- Noise level. D- Visual .	Major Major Major Oil leakage	Measurement Measurement Measurement Visual	100% 100% 100% 100%	vendor INSP NORMS vendor INSP NORMS vendor INSP NORMS vendor INSP NORMS	vendor INSP NORMS vendor INSP NORMS vendor INSP NORMS vendor INSP NORMS	QA/FMT/11 do do do		V V V V	W W W W	- - - -	
*V= Verification as appropriat. *M= Manufacturer/Sub contractor. *W=Witness , *VE= Manufacturer/ sub contractor Vendor. *S.T.C= Supplier Test Certificate, *B =BHEL/Nominated inspection agency. *O.S.L = Out Side Lab, *D.I.R=Daily inspection register. *R.Q.C = Rvendoript Quality Control (vendor) . *P =Perform. *Q.C.R = Qua;ity Control Register (vendor) . *T.C. = Test Certificate, *D.I.R = Daily inspection register. *D = Documents. *U.E.R. =Ultra Sonic Examination Record .			MANUFACTURER SEAL AND SIGN		CONTRACTOR SIGN AND SEAL .		NAME & SIGN OF APPROVING AUTHORITY & SEAL /HPGCIL						

1	2	3	4	5	6	7	8	9	10				11
Sr. No.	COMPONENT& OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD	D	AGENCY			REMARKS
										VE	M	B	
2	Motor Assembly :	A-Winding Insulation test.	Major	High Volt. Test	100%	I S :325-96 1.5 KV for 5 SEC	I S :325-96 1.5 KV for 5 SEC.	D.I.R QA/FMT/13		V	W	V	
		B-Insulation Resistance	Major	Measurement	100%	> 10 mega ohms	> 10 mega ohms	Test report		V	W	V	
		C-Motor testing for elect. Pmt.	Major	Elect.	100%	IS : 325	IS : 325	Test report		V	W	V	
		D-Vibration measurement & noise lev	Major	Measurement	100%	vendor - Norms	vendor -Norms	Test report		V	W	.	
3	Speed Governor Assembly :	Tripping speed Easy Run test	Major	Function Check	100%	I S : 9878 LCH -112	I S : 9878 LCH - 112	T.C IN Pant.		V	W	V	
4	Controller Assembly / VVVF Unit.	1. Visual Inspection 2. Electrical Checks (Routine Test). 3. Functional Checks 4. Pretreatment in seven tank for sheet & paint thickness.	Major do do Major	Visual Electrical Function Measurement + Visual	100% 100% 100% Sampling	vendor Norms do do do	vendor Norms do do do	T.C do do vendor - FMT.		V V V V	W W W W	V V V V	
*V= Verification as appropriat. *M= Manufacturer/Sub contractor. *W=Witness , *VE= Manufacturer/ sub contractor Vendor. *S.T.C= Supplier Test Certificate, *B =BHEL/Nominated inspection agency. *O.S.L = Out Side Lab, *D.I.R=Daily inspection register. *R.Q.C = Rvendoript Quality Control (vendor) . *P =Perform. *Q.C.R = Qua;ity Control Register (vendor) . *T.C. = Test Certificate, *D.I.R = Daily inspection register. *D = Documents. *U.E.R. =Ultra Sonic Examination Record .			MANUFACTURER SEAL AND SIGN		CONTRACTOR SIGN AND SEAL.		NAME & SIGN OF APPROVING AUTHIRITY & SEAL.						

1	2	3	4	5	6	7	8	9	10				11
Sr. No.	COMPONENT& OPERATION	CHARATERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMATE OF RECORD	AGENCY				REMARKS
									D	VE	M	B	
5	Mechanical assembly :	Cage assembly .	Major	Measurement	100%	Appd. L/o DRG. vendor-INSP. Norms	Appd. L/o DRG. vendor-INSP. Norms	QA/FMT/15		V	W	V	
6	Painting	Parts & Components	Major	Cross Hatch Test	Sampling	vendor-INSP. Norms	vendor-INSP. Norms	QA / REG.		V	W	V	
			Major	Powder Coating Thickness Test	Sampling	vendor-INSP. Norms	vendor-INSP. Norms	QA / REG.		V	W	V	
6	Electrical Assembly	1- Break assembly .	Minor	Function check	Sampling	vendor- NORMS	vendor - NORMS	TC		V	W	V	
*V= Verification as appropriat. *M= Manufacturer/Sub contractor. *W=Witness , *VE= Manufacturer/ sub contractor Vendor. *S.T.C= Supplier Test Certificate, *B =BHEL/Nominated inspection agency. *O.S.L = Out Side Lab, *D.I.R=Daily inspection register. *R.Q.C = Rvendoript Quality Control (vendor) . *P =Perform. *Q.C.R = Qua;ity Control Register (vendor) . *T.C. = Test Certificate, *D.I.R = Daily inspection register. *D = Documents. *U.E.R. =Ultra Sonic Examination Record .			MANUFACTURER SEAL AND SIGN		CONTRACTOR SIGN AND SEAL.		NAME & SIGN OF APPROVING AUTHORITY & SEAL						

CLAUSE NO.	Quality Assurance									
TESTS /CHECKS Items	Service Elevators (ELECTRICAL & MECHANICAL) Passenger/ Service Elevators And Lifts									
	Material Test	DPI/MPI	Ultrasonic Test	Dimensions/Physical	Functional/ Operational Test/ Run Test	Performance Test	Other Tests	All routine tests as applicable	Plain shade, thickness & adhesion	Assembly/fit up
	Shaft/ Rack/Gears	Y	Y	Y	Y					
	Geared Machine				Y					
	VVVF Panel				Y		Y3	Y	Y	
	Electrical motor				Y			Y		
	Complete Lift/ Elevator				Y	Y1	Y2			Y
Y1 –TEST TO BE DONE AT SITE Y2 - LOAD/OVERLOAD TEST TO BE DONE AT SITE AS APPLICABLE. Y3 – Burn in test on electronic card NOTE: 1. This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the applicable practices and procedures followed along with relevant supporting documents during QAP finalization. 2. Makes of all bought out items shall be subject to NTPC approval.										
Anpara 'D'TPS (2 x 500 MW) Main Plant Turnkey Package		TECHNICAL SPECIFICATIONS SECTION VI, PART-B				Sub-Section – III E- 22 Elevators			Page 1 of 1	



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07.12.2017

SHEET 1 OF 2

**ANNEXURE-I
LIST OF MAKES**

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
1.	WIRE ROPES	USHA MARTIN BHARAT WIRE ROPE	RANCHI MUMBAI.	
2.	TRAILING CABLE	GEBUR & GRILLER- AUSTRIA DAETWYLER (THELMA) CABLES- SWITZERLAND LAPP UNIVERSAL INCABSTEP	SWITZERLAND GERMANY - -	
3.	BUFFER SPRINGS	INDUSTRIAL STEEL SPRING ALL INDIA STEEL SPRING MANUFACTURING COMPANY KOLKATA SHAW COMPANY SUPER INDIA SPRINGS MESCO SPRING.	- - KOLKATA KOLKATA MUMBAI.	
4.	GEAR INTERNALS	PREMIUM ENERGY TRANSMISSION LTD, SICOR S.P.A- OEM	PUNE ITLY	
5.	DRIVER MOTOR	Seimens- ABB BHARAT BIJILI CGL KIRLOSKER OEM	MUMBAI FARIDABAD - - - -	
6.	STAINLESS STEEL	SAIL, MINOX METAL, JINDAL	- - -	
7.	CR SHEET	ESSAR STEELS, BHUSHAN STEELS	- -	
8.	CABLES	DELTON, NICCO UNIVERASL, FINOLEX, CCI MACROTHREM, VARSHA CABLES KEI. PARAMOUNT POLYCAB.	- - - - - - - - -	
9.	RELAYS	SIEMENS SCHNEIDER TELEMCHANIQUE SALZER,	- - -	



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07.12.2017

SHEET 2 OF 2

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		SCHNIDER ELECTRIC.	-	
10.	CONTACTORS	SIEMENS	-	
		L&T	-	
		GE	-	
		SCHNEIDER TELEMCHANIQUE.	-	
11.	TRANSFORMERS	SHARP ELECTRONICS	-	
		MELCON CONTROLS	CHENNAI	
		LOGITECH	-	
		GUNHAWA ELECTRIC CO LTD.	-	
12.	INVERTOR (V3F)	YASKAWA-	GERMANY	
		TOSHIBA	JAPAN.	
13.	T GUIDES	SAVERA	CHINA	
		D.D HITECH	-	
14.	CAR DOOR OPERATOR	Wittur GMBH	AUSTRIA	
		FERMATOR	-	
		OEM	-	
15.	INFRA-RED DOOR CURTAIN	MEMCO	UK	
		WECO	-	
		TLJONES	-	
16.	BATTERY (LEAD ACID)	EXIDE.		
		HBL POWER SYSTEM-	HYDERABAD	
		AMAR RAJA	TIRUPATI	
		AMCO SAFT INDIA LTD	BANGALORE.	

NOTE:

1. THE SUB VENDOR LIST ABOVE IS INDICATIVE ONLY AND IS SUBJECT TO BHEL AND CUSTOMER APPROVAL DURING DETAILED ENGINEERING STAGE WITHOUT ANY COMMERCIAL & DELIVERY IMPLICATION TO BHEL.

BIDDER TO PROPOSE SUB VENDOR WITHIN 4 WEEKS OF PLACEMENT OF LOI. THEREAFTER NO REQUEST FOR ADDITIONAL SUB-VENDOR SHALL BE ENTERTAINED.

2. IN CASE OF ASSEMBLED IMPORTED ELEVATOR, MAKES OF BOI SHALL BE SUBJECT TO BHEL/ CUSTOMER APPROVAL DURING DETAIL ENGINEERING STAGE WITHOUT ANY COMMERCIAL IMPLICATION AT CONTRACT STAGE.
3. DEALERS ARE NOT ACCEPTABLE FOR ANY ITEM OF THE PACKAGE. BIDDER SHALL PROCURE ALL ITEMS INCLUDING PLATES, STRUCTURAL ETC. FROM APPROVED SUB VENDOR ONLY.



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07/12/2017

SHEET 1 OF 2

ANNEXURE-II
MANDATORY SPARES



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07/12/2017

SHEET 2 OF 2

ANNEXURE-II
List of Mandatory Spares for elevator.

One set for Service building elevator and one set for administrative building elevator shall be provided i.e. total two (02) sets.

Sl. No.	DESCRIPTION	Qty. / Unit	Remark
A	Control Panel		As Applicable
1	Copper Contactors	05 Nos. of each type & size	
2	Carbon Contacts	05 Nos. of each type & size	
3	Compression Spring	05 Nos. of each type & size	
4	Interlocking switch	05 Nos. of each type & size	
5	Contactors	1 No. of each type & model	
6	Coils for contactors	2 Nos. of each type	
7	Relays	1 No. of each type & model	
8	Relay Coils	10 Nos. of each type & model for each type of Elevator	
9	Resistors	100% of total quantity In one elevator of each type	
10	Capacitors	100% of total quantity In one elevator of each type	
11	Suppressor Unit	100% of total quantity In one elevator of each type	
12	Fuses	100% of total quantity In one elevator of each type	
13	Control Rectifier	1 No. of each type	
B	Lift Car		
1	Fixed contact assembly	2 Nos. each type	
2	Moving contact assembly	2 Nos. each type	
3	Operating Lever	2 Nos. each type	
4	Roller & Tyre	2 Nos. each type	
5	Car fan	1 No. each type	
6	Dry reed switch	1 No. each type	
7	Cam arrangement	1 No. each type	
8	Roller assembly	2 Nos. for each type of Elevator	
C	Entrances		
1	Landing gate lock complete	4 nos.	
2	Fixed contact assembly	5 Nos. of each type	
3	Moving contact assembly	5 Nos. of each type	
4	Lock arm assembly	5 Nos. of each type	
5	Roller tyre	6 Nos. of each type	
6	Emergency release keys	2 Nos.	
7	Landing push button station C/W push & cover plate	5 Nos. of each type	
D	Miscellaneous		
1	Pushes to suit car and landing push stations	12 Nos. each type	
2	indicator units to suit car and landing indicators	12 Nos. each type	
3	Passenger alarm bell	1 No.	



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07/12/2017

SHEET 3 OF 2

4	Emergency battery unit	1 No.
5	Bulbs	24 Nos.
6	Microprocessor Card (if microprocessor used).	1 set (Complete for one elevator)
7	Door motor	1 No. each type
8	Trailing Cable	Length sufficient for one car.
E	Winding Unit	
1	Set of Brake shoe lining with rivets	2 Sets each type
2	Brake Coil	6 Nos.
F	Electric Motors / Electricals	
1	Set of Bearings for all motors	1 Sets for each type of Elevator
2	V- Belts	2 Sets
3	Micro switches	2 Sets
4	Solenoids	2 Nos. each type

Note:

- Unless stated otherwise, a 'set' means item or sub-items required for each type/ size, range of assembly/ sub- assembly required for complete replacement in one equipment system; it is further intended that the assembly/ sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in marinating two different sets of spares to be used for subject assembly/ sub assembly, these shall be considered as different type of assembly/ sub assembly.
- Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by the vendor shall be the specified percentage (%) of total population required to meet the specification requirements. In case the quantity of mandatory spares so calculated happens to be in fraction, the same shall be rounded off to next higher whole number.
- Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc, these shall cover all the items supplied and installed and the breakup of these shall be furnished by the vendor during detail engineering.
- In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to the offered design with quantities generally in line with the approach followed in the above list.
- Wherever bidder has indicated an item as not applicable, the same will have to be supplied free of cost, in case it is found applicable during detail engineering.



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07.12.2017

SHEET 1 OF 2

ANNEXURE-III

LIST OF TOOLS AND TACKLES



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07.12.2017

SHEET 2 OF 2

ANNEXURE-III

List of Tools & tackles for elevator.

Sl. No.	DESCRIPTION	Qty.	Remarks
1	Spanner of all sizes required for maintenance	1 Set.	
2	Adjustable Spanner	1 No.	
3	Allen Key set all sizes required for maintenance	1 Set	
4	Screw driver set	1 No	
5	Cutting plier	1 No	
6	Grease gun	1 No	
7	Nose plier	1 No	
8	Grip plier	1 No	
9	Hook spanner	1 No	
10	Box spanner	1 No	
11	Oil can	1 No	
12	Measurement Taps	1 No	
13	Paint brush 1/4,1/2,3/4 inch	1 No. of each	
14	Line tester	1 No	
15	Multimeter	1 No	
16	Soldering iron	1 No	
17	Torch Light	1 No	
18	Knife cutter	1 No	
19	Steel rule	1 No	
20	Wire Striper	1 No	
21	Tube Spanner Combination	1 No	
22	Hammer 1/2 Kg	1 No	
23	Dial wrench	1 No	



TITLE:
**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPEC. NO. PE-TS-298-502-A001

VOLUME IIB

SECTION IA

SUB-SECTION

REV. 00

DATE: 07.12.2017

SHEET 1 OF 1

ANNEXURE-IV

Drawing document submission schedule

S.NO.	Description	Schedule
1	First submission of dwg/docs as per MDL	Within two (2) weeks from placement of LOI.
2	Every repeat submission	Within one (1) week.
3	Response time by BHEL	Within three (3) weeks after receiving of drawing.

Note:

- 1.0 The above are the minimum quantity of drawings/documents required. The exact requirement shall be informed to the successful bidder during detail engineering stage for which no commercial implication shall be entertained by BHEL.
- 2.0 Bidder to note that BHEL reserves the right for drawing/document submission through web based Document Management System. Bidder would be provided access to the DMS for drawing/document approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.
 - Internet explorer version – Minimum Internet Explorer 7.
 - Internet speed – 2 mbps (Minimum preferred).
 - Pop ups from our external DMS IP (124.124.36.198) should not be blocked.
 - Vendor's internal proxy setting should not block DMS application's link (<http://124.124.36.198/wrenchwebaccess/login.aspx>).

	TITLE TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE – TS –298-502 – A001	
		VOLUME III	
		SECTION- IA	
		REV 0	DATE 07.12.2017
		SHEET OF	

ANNEXURE-V

MDL FOR ELEVATOR

S. NO.	BHEL DOC No	TITLE	PURPOSE
1	PE-V0-298-502-A101	TDS OF SERVICE BUILDING ELEVATOR	A
2	PE-V0-298-502-A102	TDS OF ADMINISTRATIVE BUILDING ELEVATOR	A
3	PE-V0-298-502-A001	GA, M/C ROOM LAYOUT, SCOPE & BOM OF PASSENGER ELEVATOR (SERVICE BUILDING)	A
4	PE-V0-298-502-A002	GA, M/C ROOM LAYOUT, SCOPE & BOM OF PASSENGER ELEVATOR (ADMINISTRATIVE BUILDING)	A
5	PE-V0-298-502-A003	MQP FOR BUILDING ELEVATOR (COMMON FOR SERVICE BUILDING AND ADMINISTRATIVE BUILDING)	A
6	PE-V0-298-502-A004	WIRING DIAGRAM AND POWER SCHEMATIC FOR SERVICE BUILDING AND ADMINISTRATIVE BUILDING ELEVATOR	I
7	PE-V0-298-502-A005	O&M MANUAL FOR BUILDING ELEVATOR (COMMON FOR SERVICE BUILDING AND ADMINISTRATIVE BUILDING)	I

A= APPROVAL

I= INFORMATION

ANNEXURE-VI

Check List for Operation & Maintenance Manual

Project name :

Project number :

Package Name :

PO reference :

Document number :

Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

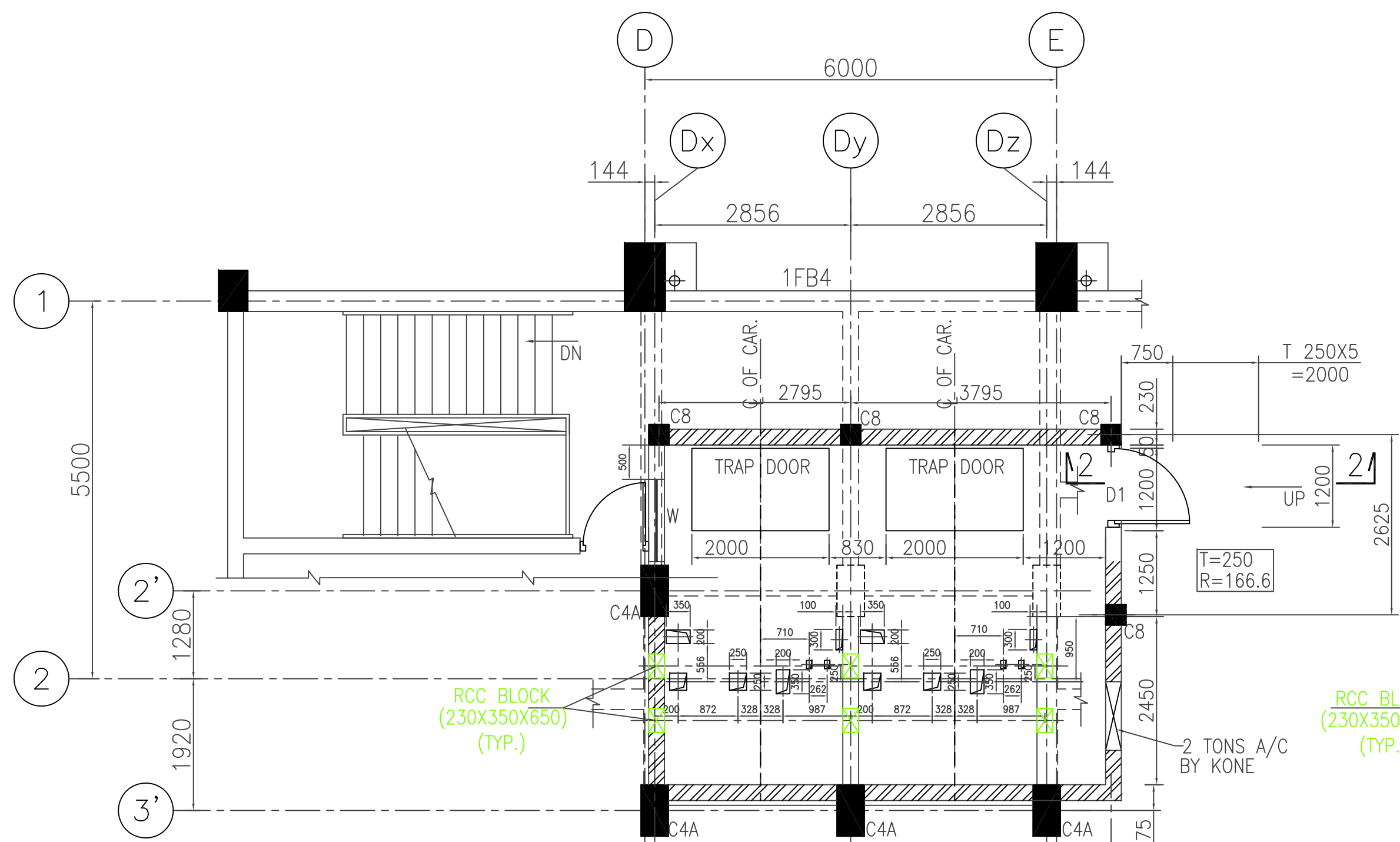
4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5.1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5.2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5.3	Do's & Don't of the equipments.				
5.4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5.5	Parameters to be monitored with normal values and limiting values				
5.6	Trouble shooting with causes and remedial measures				
5.7	Routine operational checks, recommended logs & records				
5.8	Changeover schedule if more than one auxiliary for the same purpose is given				
5.9	Painting requirement and schedule				
5.10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				

6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	Statutory and other specific requirements considerations.				
8.0	List of reference documents				
9.0	Binding as per requirement				

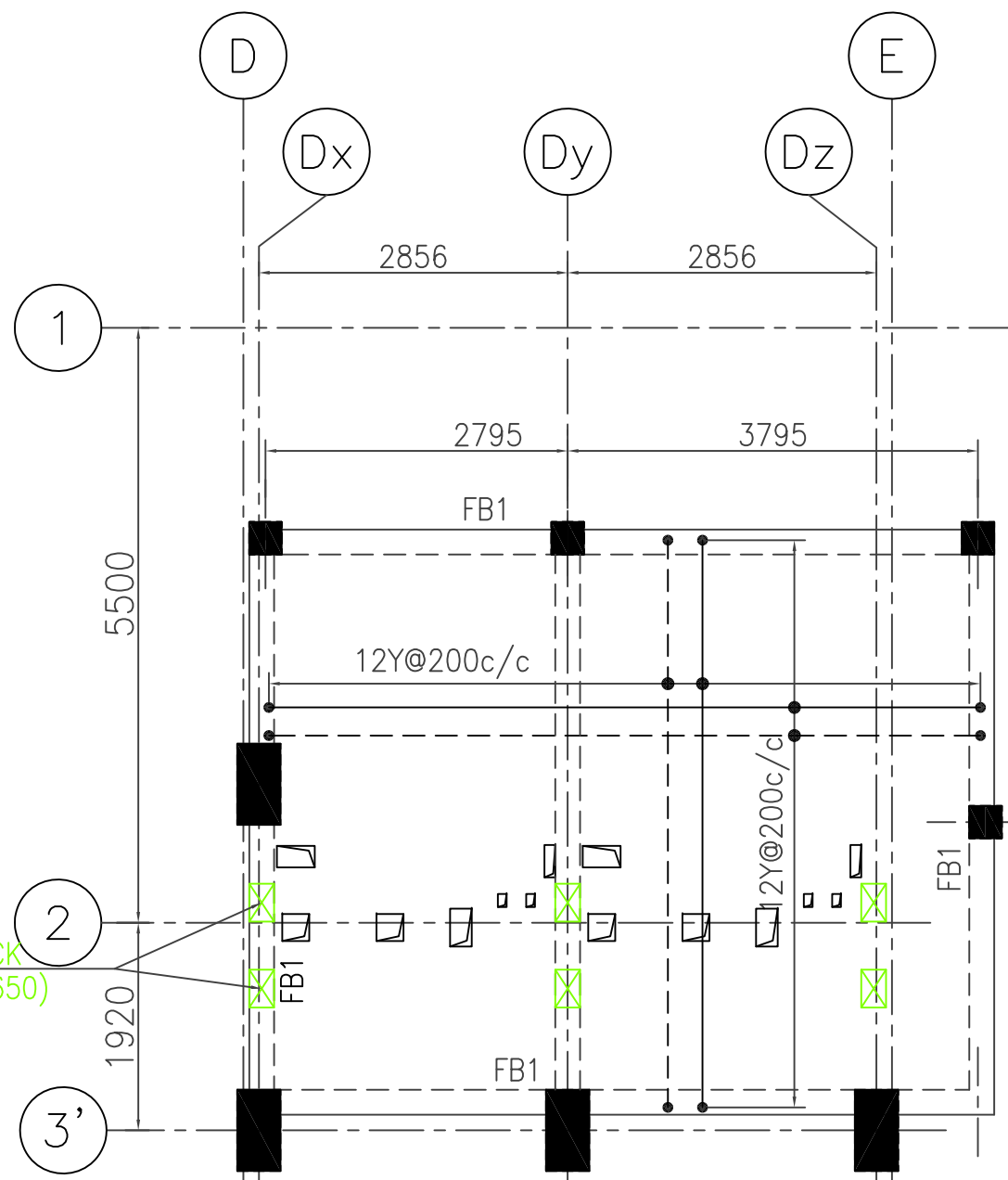
	TITLE: TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IA	SUB-SECTION
		REV. 00	DATE: 07.12.2017
		SHEET 1 OF 1	

CIVIL INPUT

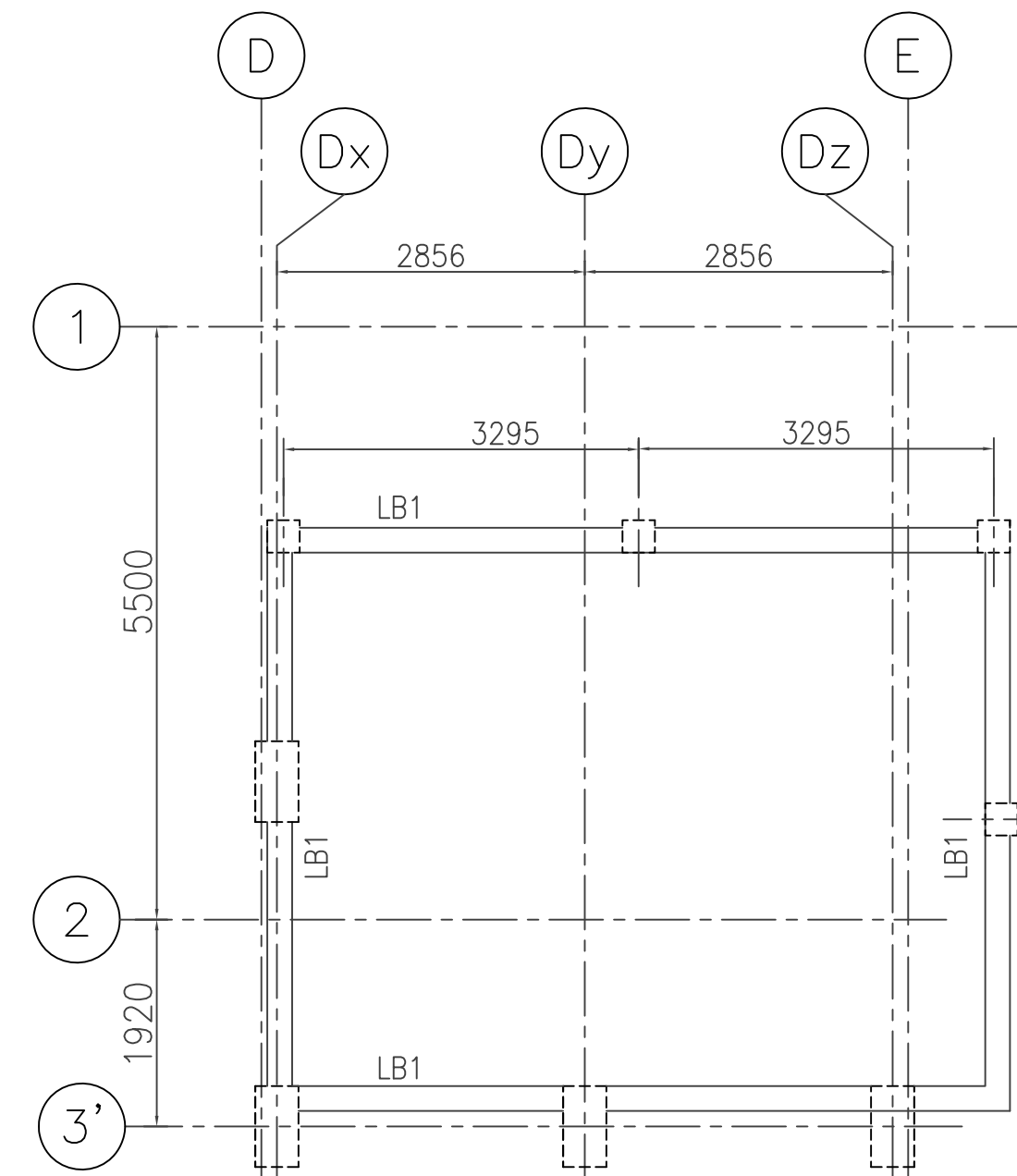
(Refer attached civil input assignment drawings.)



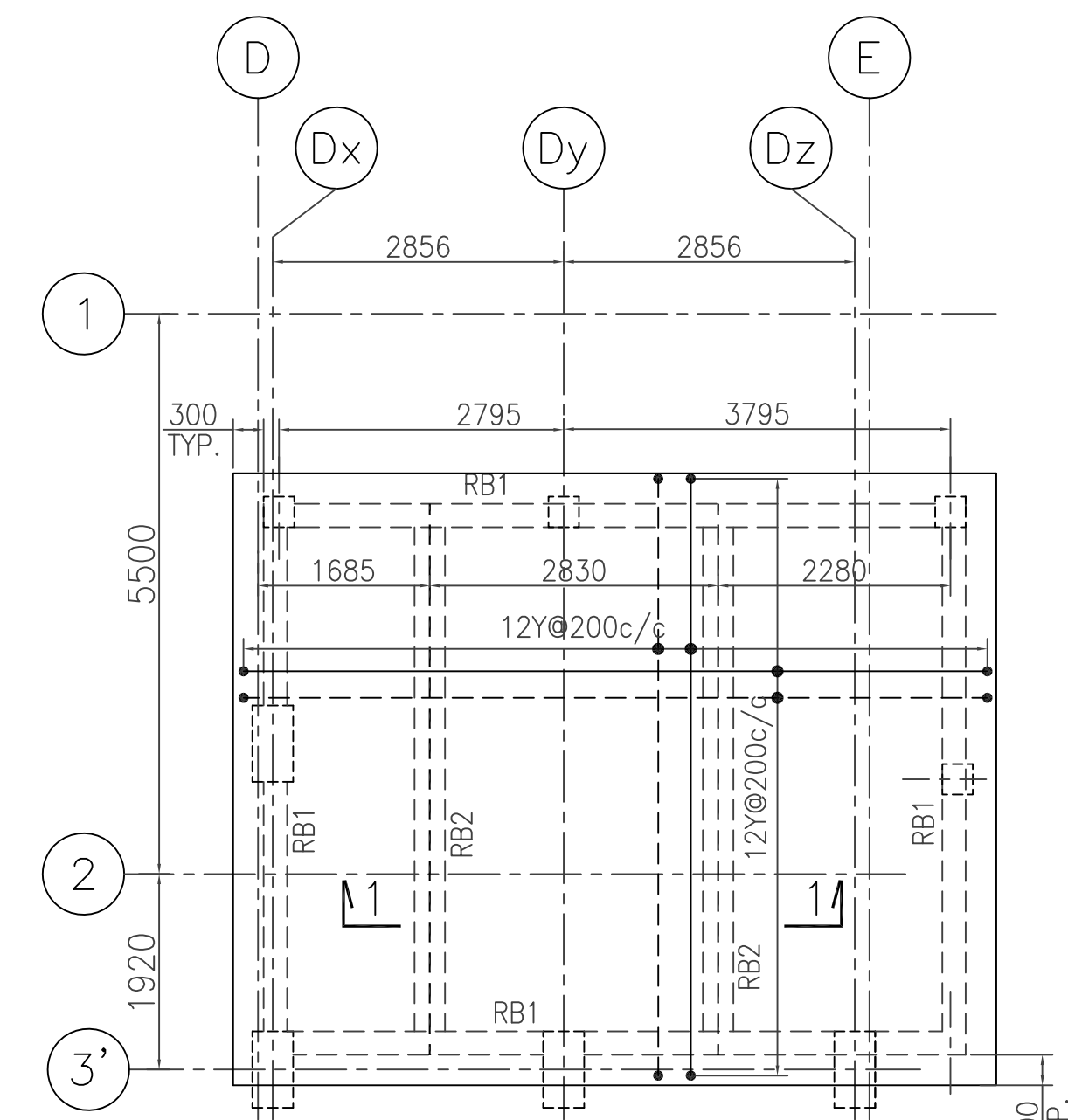
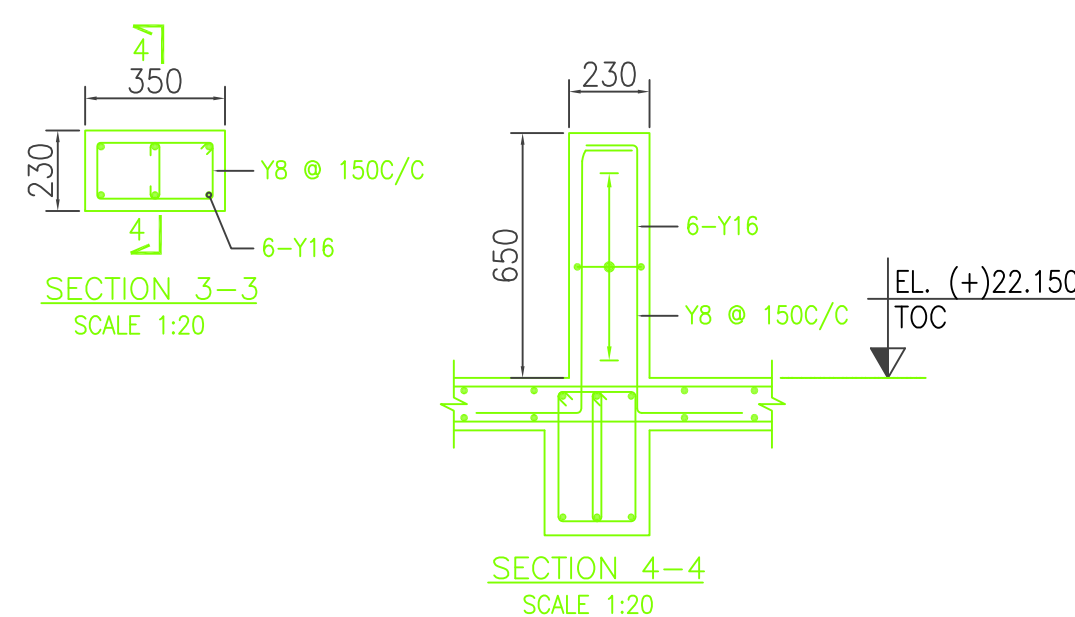
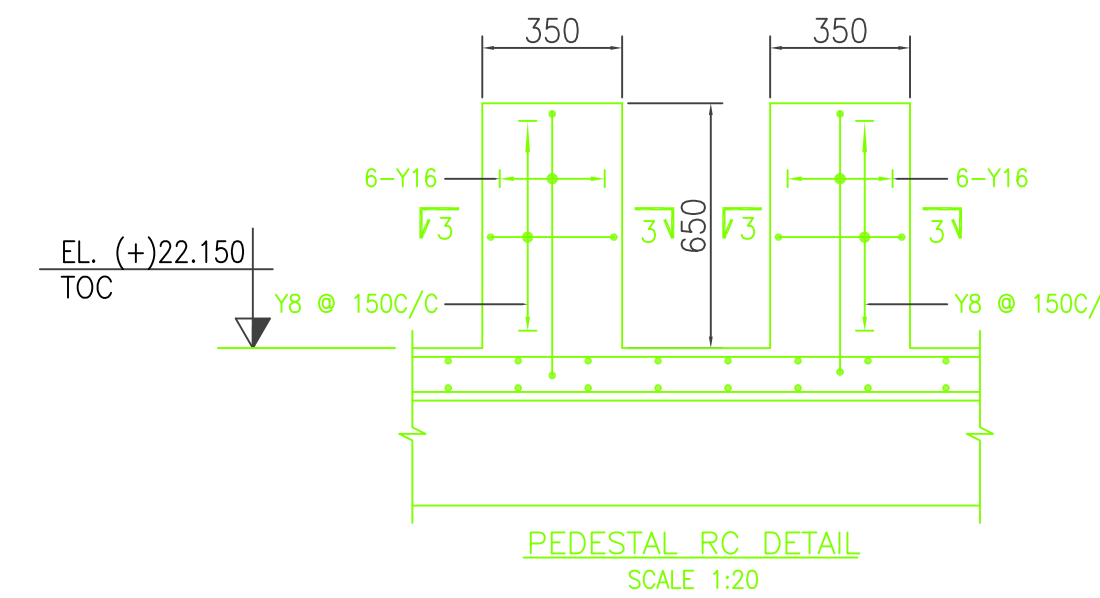
LIFT M/C ROOM AT EL.(+)22.200M (FFL)



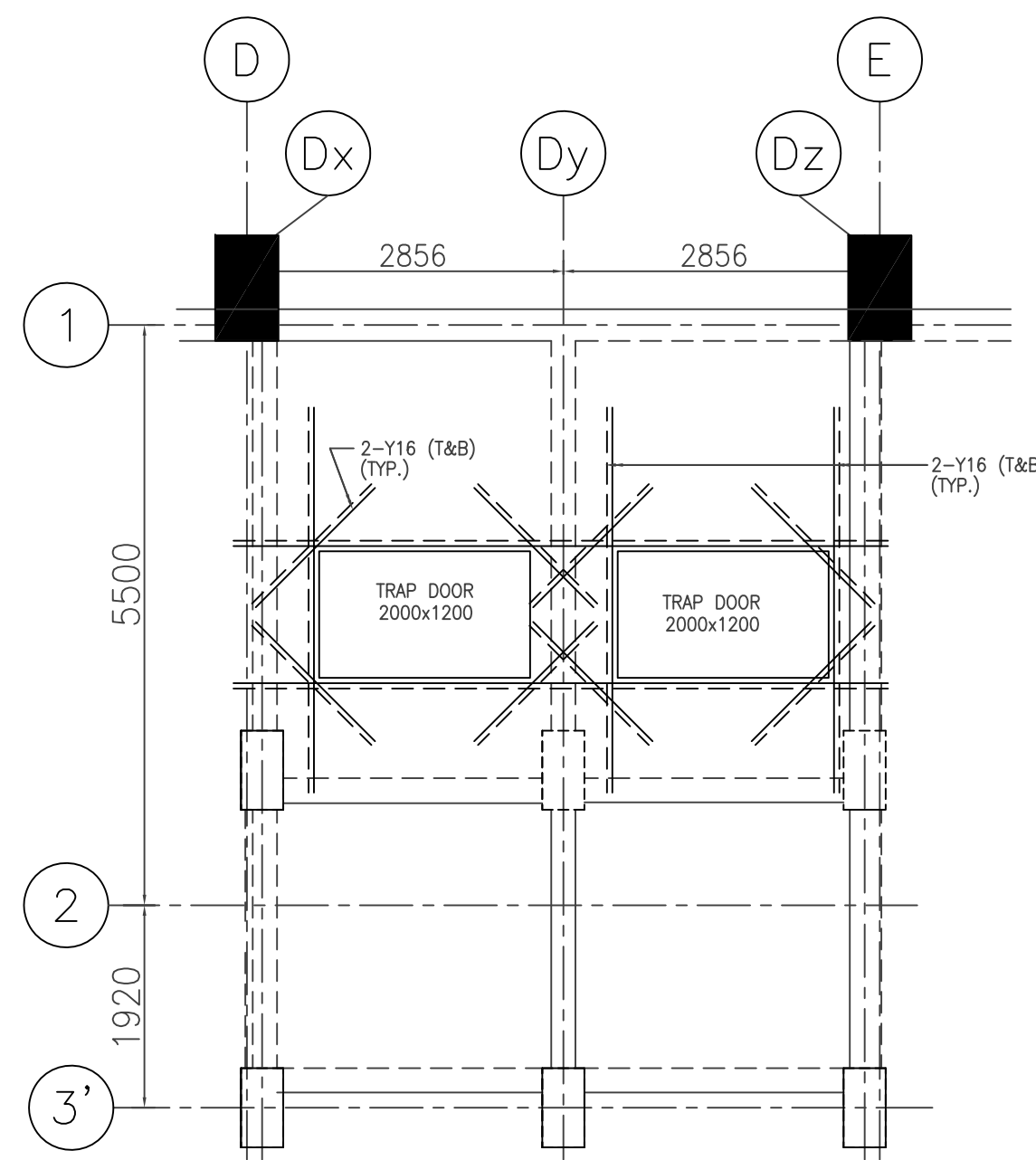
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(SLAB THICKNESS 150mm)



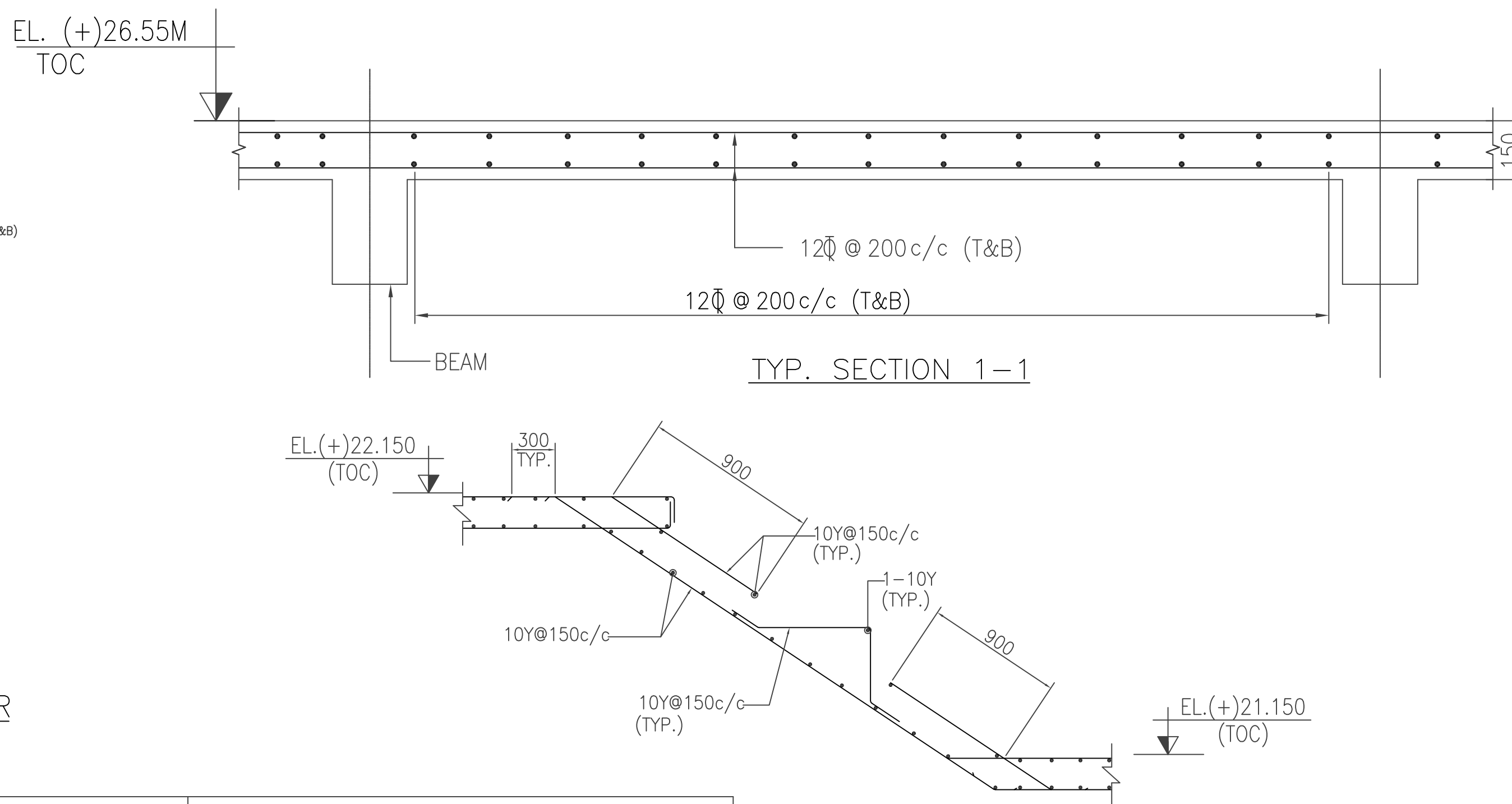
PLAN AT EL.(+)24.300(BOC)
(LINTEL BEAM-LB1(230X300))



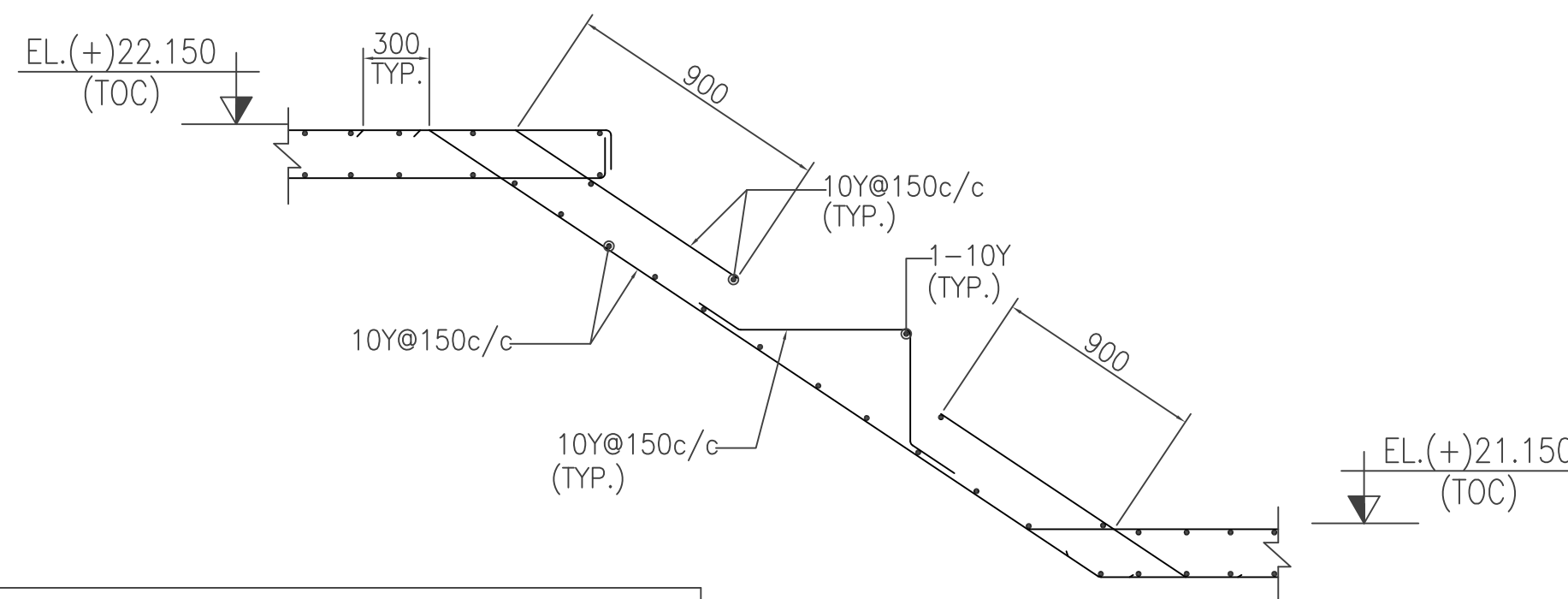
PLAN AT EL.(+)26.550(TOC)
(SLAB THICKNESS 150mm)



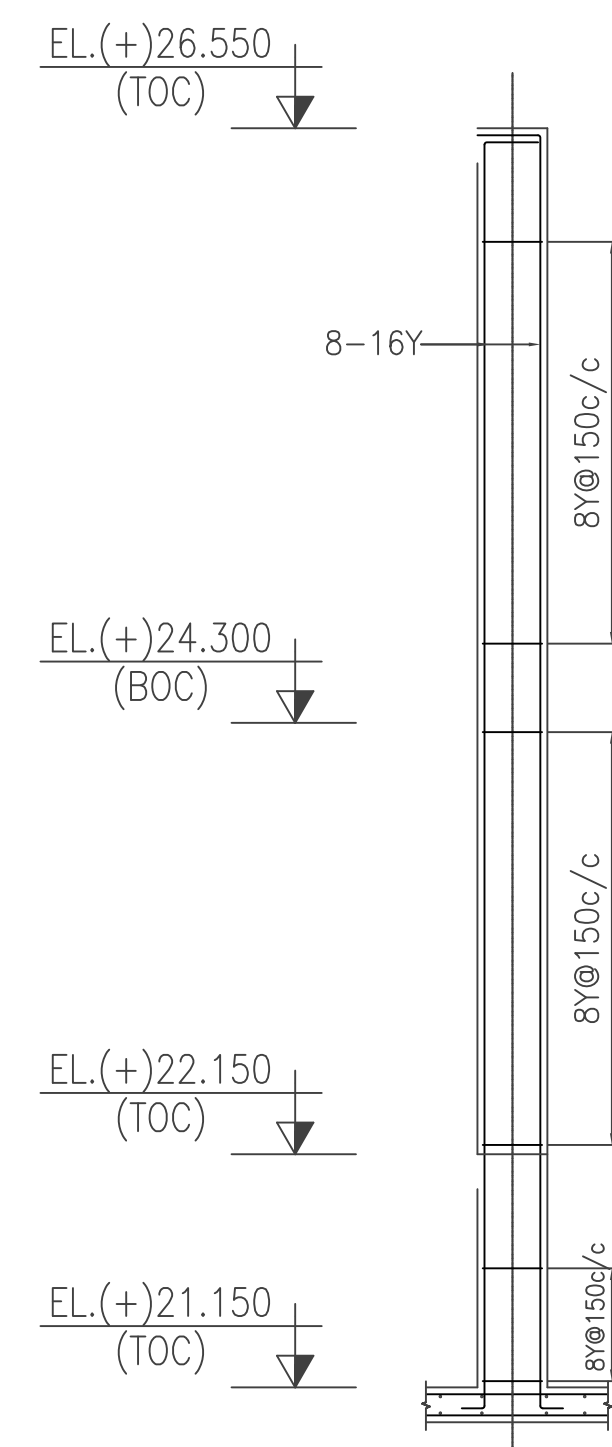
OPENING DETAILS AROUND TRAP DOOR



TYP. SECTION 1-1



SECTION 2-2



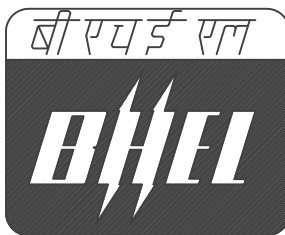
TYP. ELEVATION COLUMN C8
(SLAB THICKNESS 150mm)

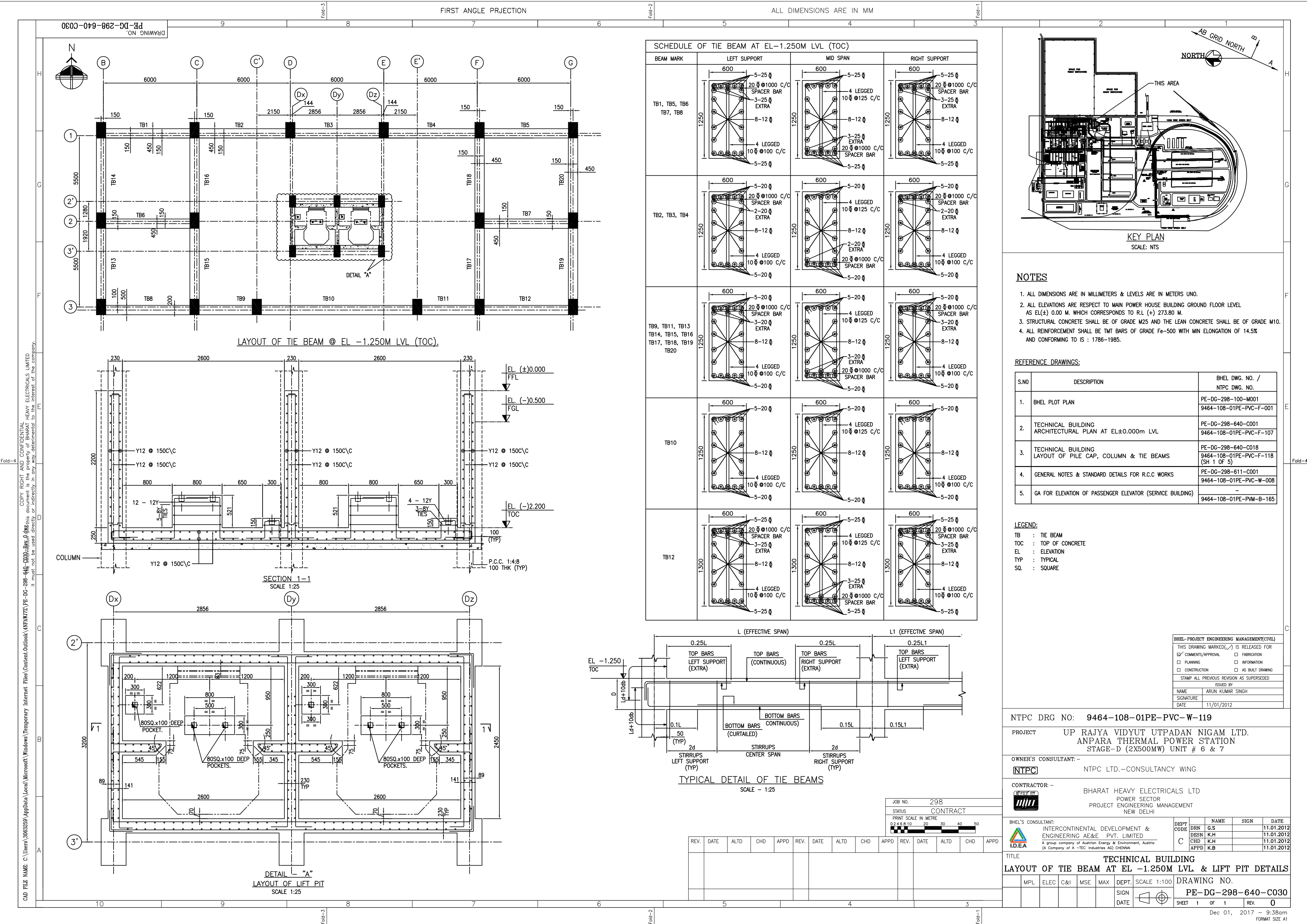
SCHEDULE OF LINTEL BEAMS AT EL.(+)24.300M LVL.(BOC)			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
LB1			

SCHEDULE OF ROOF BEAMS AT EL.(+)26.550M LVL.(TOB)			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
RB1			
RB2			

SCHEDULE OF OPENINGS					
SYMBOL	NO.S	SILL LEVEL AT EL..	MASONRY OPENING		REMARKS
			WIDTH	HEIGHT	
D1	1	EL+22.20M	1200	2100	SINGLE SHUTTER STEEL DOOR
W1	1	EL+23.10m	600	900	ALUMINIUM FRAMED FIXED GLASS WINDOW

SCHEDULE OF FLOOR BEAMS AT EL.(+)22.150M LVL.(TOB)			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
FB1			
FB2			

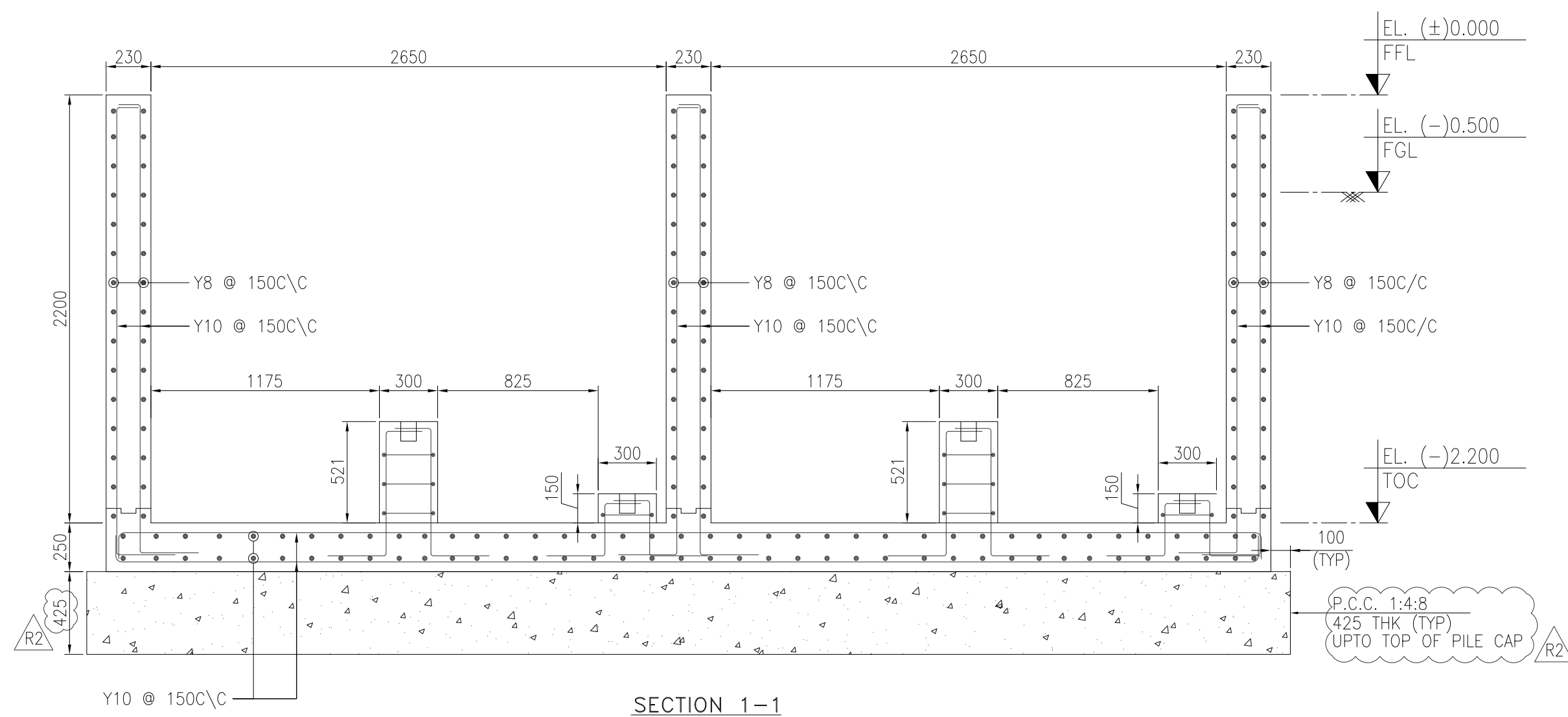
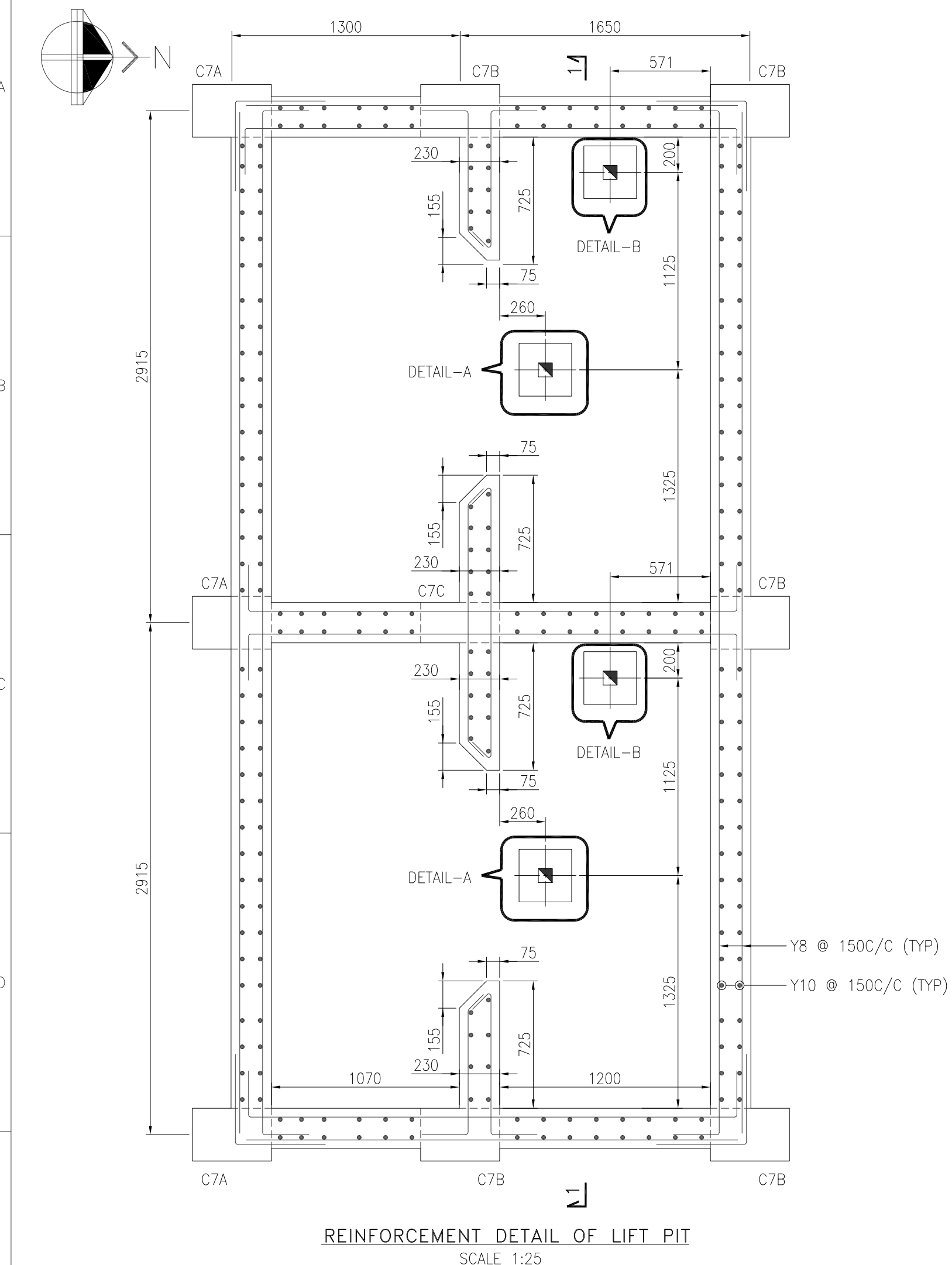
1. LIFT MACHINE ROOM DETAILS PROVIDED.					
DCN Initiating Department					
APPROVAL OF DEs / PEs	DEPARTMENT	CIVIL			NTPC DRG NO:9464-108-01PE-PVC-F-129
	SIGNATURE	-Sd-			
	NAME	A.K.SINGH			
	DATE	31.03.2016			
	PROJECT TITLE ANPARA THERMAL POWER STATION STAGE-D (2X500MW) UNIT # 6 & 7			JOB NUMBER 298	
	DRAWING NUMBER PE-DG-298-640-C028			DCN NUMBER DCN-254	
	TITLE OF DRAWING <u>TECHNICAL BUILDING - LAYOUT OF</u> <u>ROOF SLABS & BEAMS AT EL+21.15M & EL+25.15M LVL (TOC)</u>			ISSUE DATE: 31.03.2016	
	DRAWING CHANGE NOTICE (DCN)			SHEET 1 OF 1	



CAD FILE NAME: C:\Users\3060250\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\4NFMW7Z\PE-DG-298-640-C030.dwg

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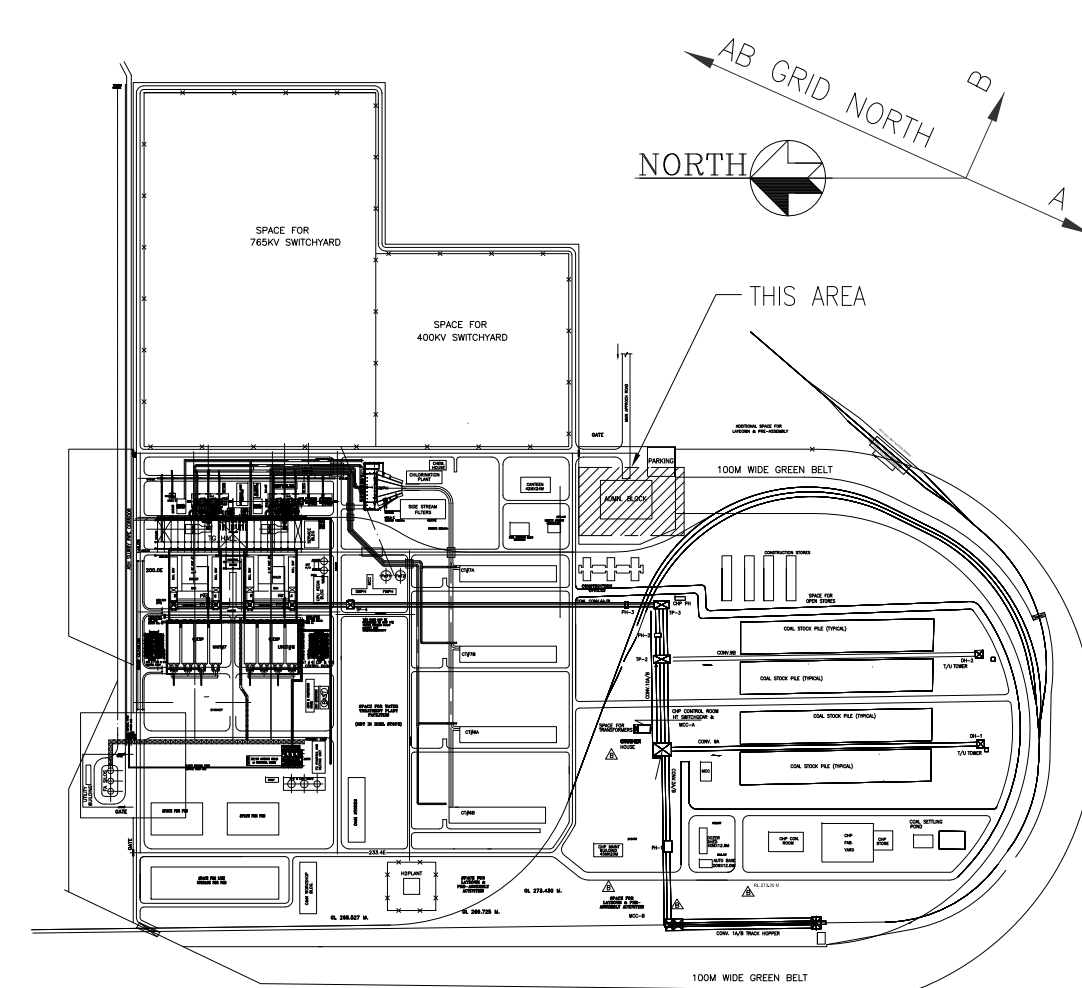
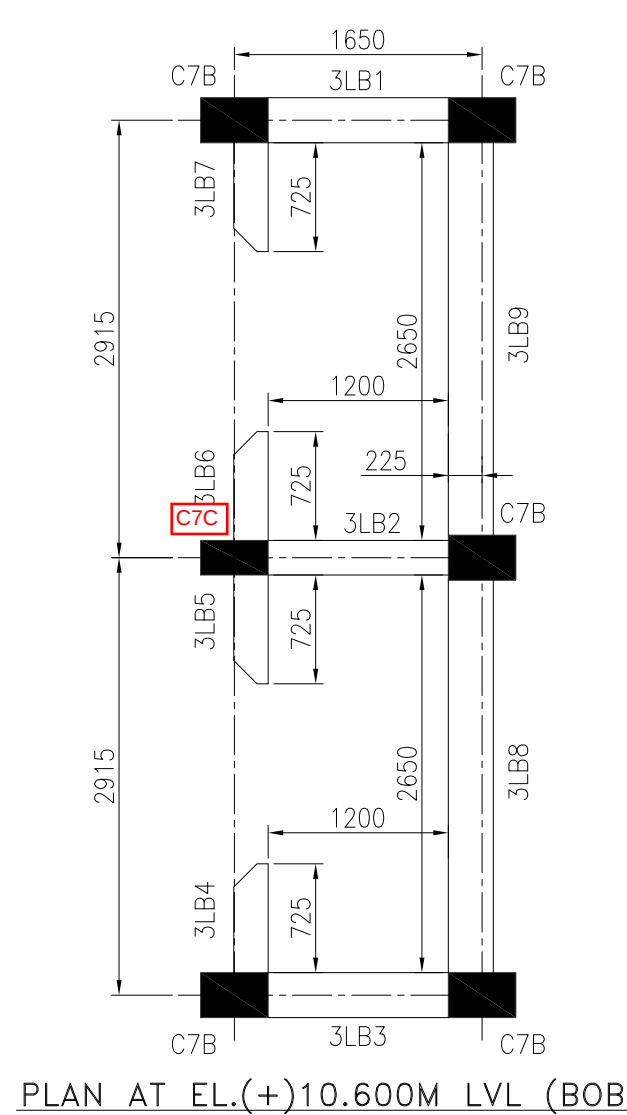
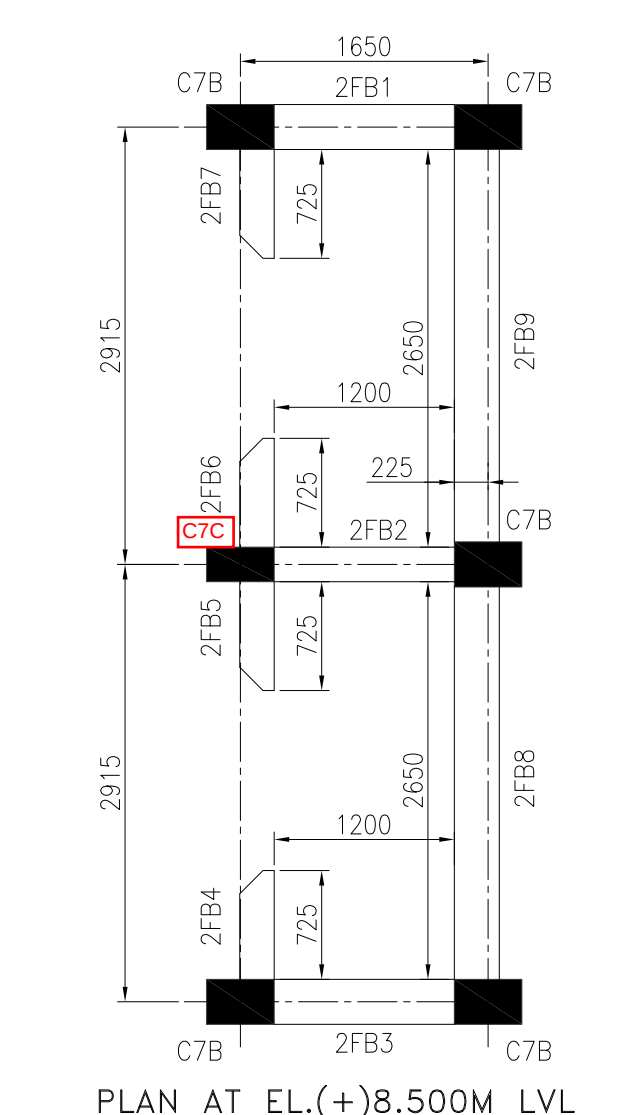
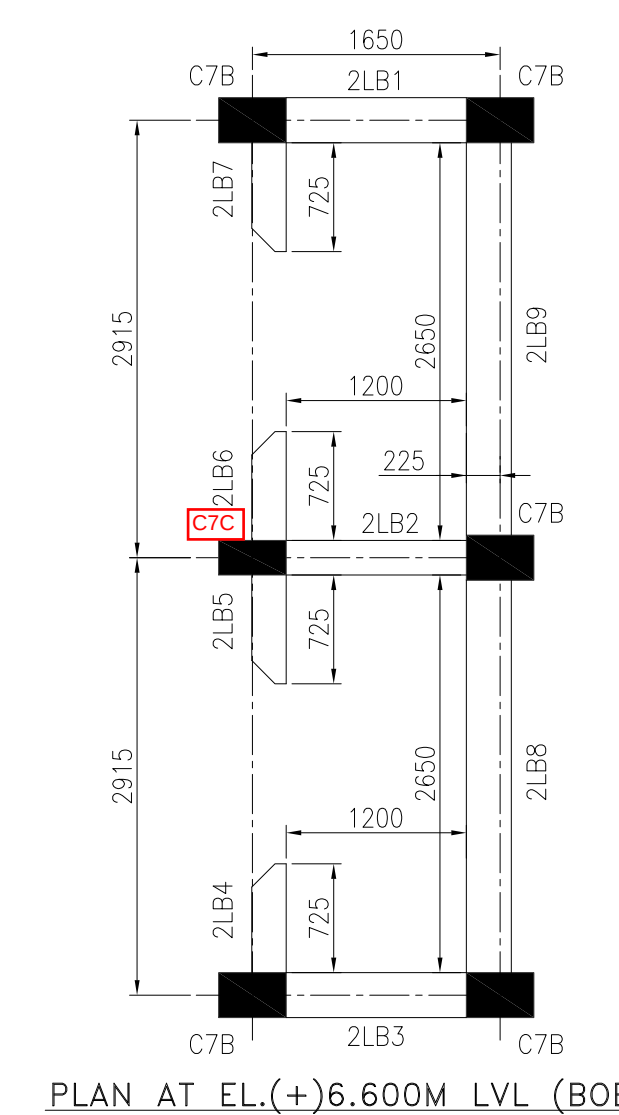
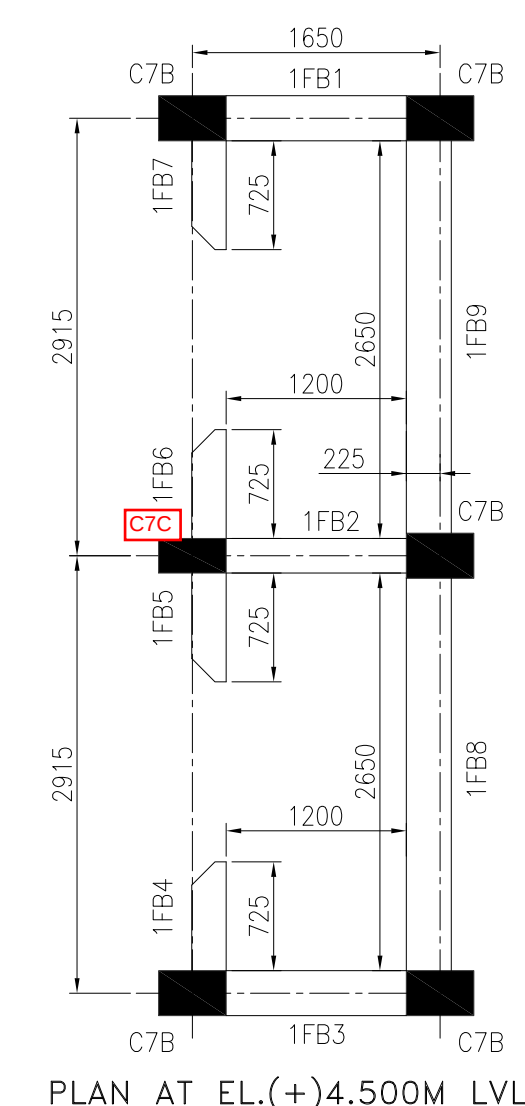
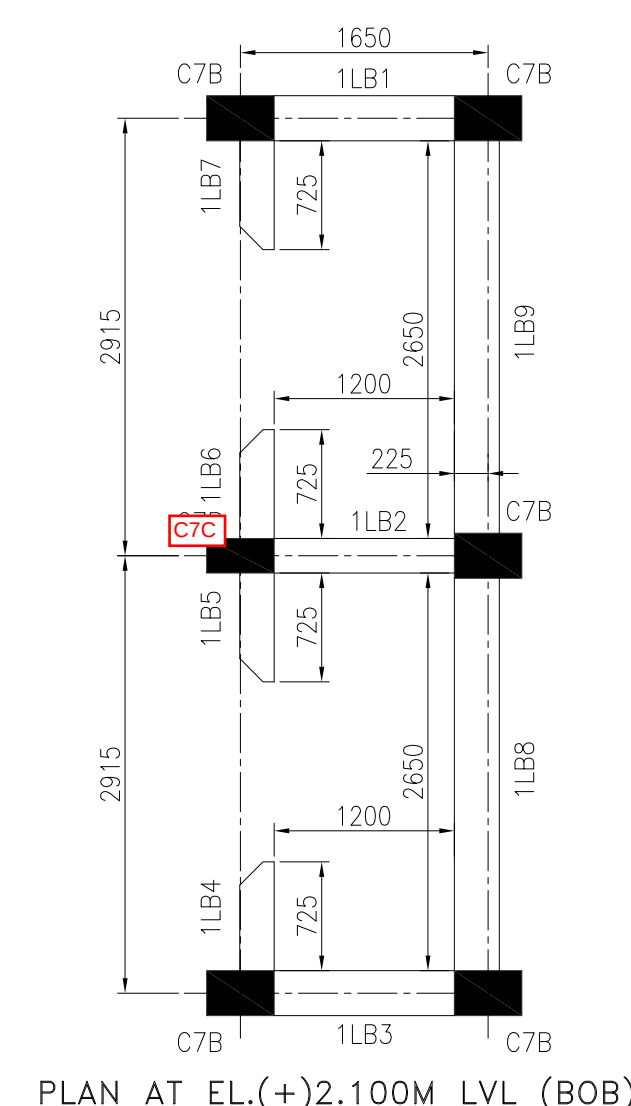
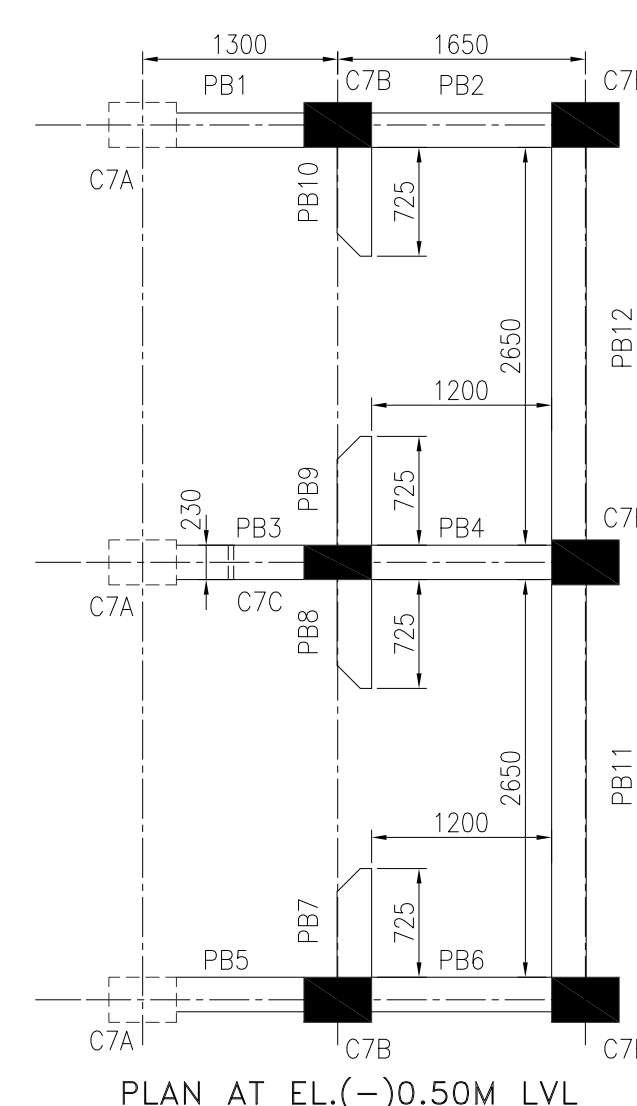
it must not be used directly or indirectly in any way detrimental to the interest of the company.



COLUMN SCHEDULE:

MARK	C7A	C7B	C7C	C7D
NOS.	3	5	1	3
TIC	FROM EL.-2,875 TO EL.-0,050	FROM EL.-2,875 TO EL.+13,450	FROM EL.-2,875 TO EL.+13,450	FROM EL.+13,450 TO EL.+17,850
SECTION				

NOTE: FOR LOCATION REFER PLAN



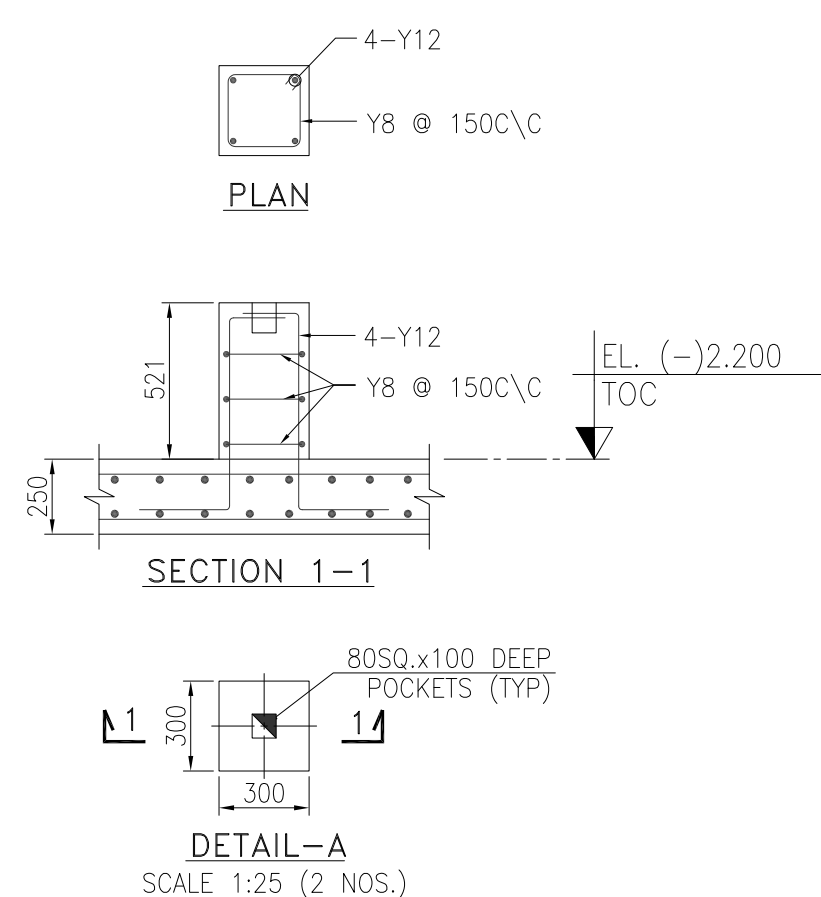
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS & LEVELS ARE IN METERS UNO.
2. ALL ELEVATIONS ARE RESPECT TO MAIN POWER HOUSE BUILDING GROUND FLOOR LEVEL AS EL (+) 0.0 M. WHICH CORRESPONDS TO RL (+) 273.80 M.
3. STRUCTURAL CONCRETE SHALL BE OF GRADE M25 AND THE LEAN CONCRETE SHALL BE OF GRADE M10.
4. ALL REINFORCEMENT SHALL BE TMT BARS OF GRADE Fe-500 WITH MIN ELONGATION OF 14.5% AND CONFORMING TO IS : 1786-1985.

REFERENCE DRAWINGS:

S.NO	DESCRIPTION	BHEL DWG. NO.
1.	PILOT PLAN	PE-DG-298-100-M001 NTPC DWG. NO. 9464-108-01PE-PVC-F-001
2.	GENERAL NOTES & STANDARD DETAILS FOR R.C.C WORKS	PE-DG-298-611-C001 9464-108-01PE-PVC-W-001
3.	ADMINISTRATION BUILDING – ARCHITECTURAL PLAN AT EL+12.500m LVL	PE-DG-298-641-C004 9464-108-01PE-PVC-F-131
4.	ADMINISTRATION BUILDING – LAYOUT & REINFORCEMENT DETAILS OF LIFT PORTION (SH 2 OF 2)	PE-DG-298-641-C008 9464-108-01PE-PVC-F-138
5.	GA FOR PASSENGER ELEVATOR ADMIN BUILDING	PE-VO-298-502-A004 9464-108-01PE-PWM-B-161

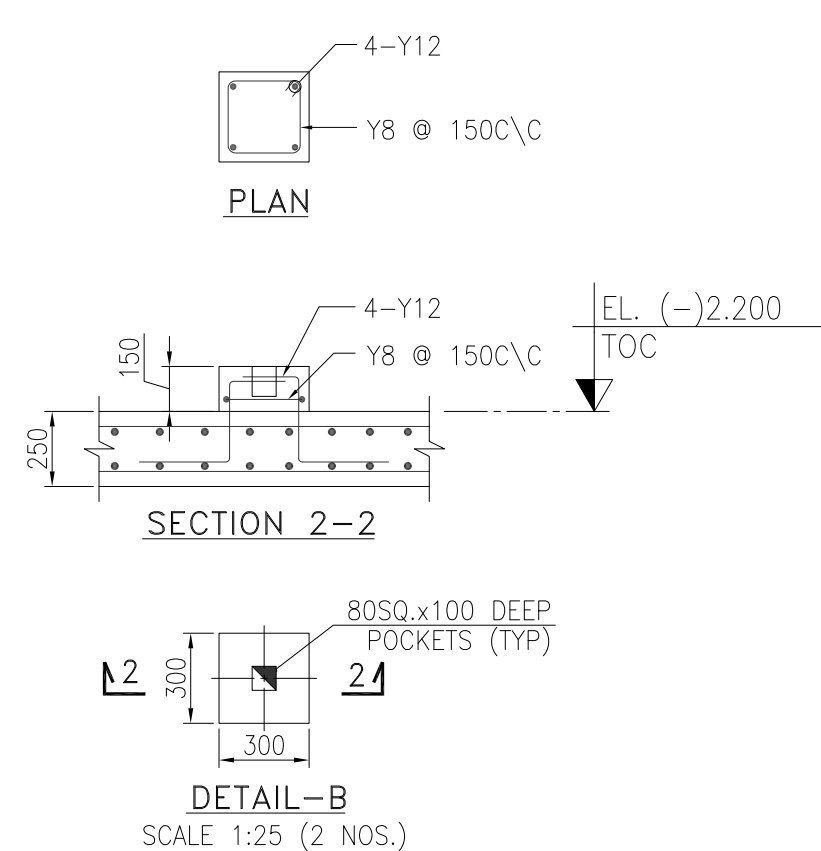
BOB : BOTTOM OF BEAM
C : COLUMN
EL : ELEVATION
FB : FLOOR BEAM
LB : LINTEL BEAM
LVL : LEVEL
P : PEDESTAL
TOB : TOP OF BEAM
TOC : TOP OF CONCRETE



SCHEDULE OF PLINTH BEAMS AT EL(-)0.500M LVL.(TOB)			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
PB1, PB2			
PB3, PB4			
PB5, PB6, PB11, P12			
PB7, PB8, PB9, PB10			

SCHEDULE OF LINTEL BEAMS AT EL.+2.100M LVL.(BOB)			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
1LB1, 1LB3	300 3-20 $\varnothing$ 1000 C/C SPACER BAR 4-LEGGED 100 $\varnothing$ 100 C/C 3-20 $\varnothing$	300 3-20 $\varnothing$ 4-LEGGED 100 $\varnothing$ 100 C/C 3-20 EXTRA 20 $\varnothing$ 1000 C/C 100 $\varnothing$ 100 C/C 3-20 $\varnothing$	300 3-20 $\varnothing$ 20 $\varnothing$ 1000 C/C SPACER BAR 4-LEGGED 100 $\varnothing$ 100 C/C 3-20 $\varnothing$
1LB2	230 3-20 $\varnothing$ 20 $\varnothing$ 1000 C/C 3-20 EXTRA 8 $\varnothing$ 100 C/C 3-20 $\varnothing$	230 3-20 $\varnothing$ 8 $\varnothing$ 100 C/C 3-20 EXTRA 20 $\varnothing$ 1000 C/C 8 $\varnothing$ 100 C/C 3-20 $\varnothing$	230 3-20 $\varnothing$ 20 $\varnothing$ 1000 C/C 3-20 EXTRA 8 $\varnothing$ 100 C/C 3-20 $\varnothing$
1LB8, 1LB9	300 3-20 $\varnothing$ 2-16 EXTRA 8 $\varnothing$ 100 C/C 3-20 $\varnothing$	300 3-20 $\varnothing$ 8 $\varnothing$ 100 C/C 2-16 EXTRA 2-16 EXTRA 3-20 $\varnothing$	300 3-20 $\varnothing$ 2-16 EXTRA 8 $\varnothing$ 100 C/C 3-20 $\varnothing$
1LB4, 1LB5, 1LB6, 1LB7	230 3-16 $\varnothing$ 8 $\varnothing$ 100 C/C 3-16 $\varnothing$		

SCHEDULE OF FLOOR BEAMS AT EL(+)4.500M LVL.(TOB)			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
1FB1, 1FB3			
1FB2			
1FB8, 1FB9			
1FB4, 1FB5, 1FB6, 1FB7			



SCHEDULE OF LINTEL BEAMS AT EL(+)6.600M LVL.(BOB)			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
2LB1, 2LB3, 2LB8, 2LB9			
2LB2			
2LB4, 2LB5, 2LB6, 2LB7			

SCHEDULE OF FLOOR BEAMS AT EL(+)8.500M LVL.(TOB)			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
2FB1 & 2FB3			
2FB2			
2FB8 & 2FB9			
2FB4, 2FB5, 2FB6, 2FB7			

SCHEDULE OF LINTEL BEAMS AT EL(+10.600M LVL.(BOB))			
BEAM MARK	LEFT SUPPORT	MID SPAN	RIGHT SUPPORT
3LB1, 3LB3, 3LB8, 3LB9			
3LB2			
3LB4, 3LB5, 3LB6, 3LB7			

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☒ COMMENTS/APPRAVAL	☐ FABRICATION
☐ PLANNING	☐ INFORMATION
☐ CONSTRUCTION	☐ AS BUILT DRAWING
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	ARUN KUNAR SINGH
SIGNATURE	
DATE	19/04/2012

NTPC DRG NO: 9464-108-01PE-PVC-F-138 (SH 1 OF 2)

PROJECT	UP RAJYA VIDYUT UTPADAN NIGAM LTD. ANPARA THERMAL POWER STATION STAGE-D (2X500MW) UNIT # 6 & 7
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OWNER'S CONSULTANT:-
NTPC LTD.-CONSULTANCY WING

CONTRACTOR: - BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

 IDEA	BHEL'S CONSULTANT:		DEPT	NAME	SIGN	DATE
	INTERCONTINENTAL DEVELOPMENT & ENGINEERING AE&E PVT. LIMITED		CODE	K.U		12.12.2019
	A group company of Austrian Energy & Environment, Austria (A Company of A - TRG Industries AG), CHENNAI.		C	DRN		12.12.2019
				DESN		12.12.2019
				CHD		12.12.2019
			APPD		12.12.2019	

TITLE ADMINISTRATION BUILDING - LAYOUT &
REINFORCEMENT DETAILS OF LIFT PORTION

MPL	ELEC	C&I	MSE	MAX	DEPT.	SCALE 1:100	DRAWING NO.
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SIGN		PE-DG-298-641-C008
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SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)



PROJECT ENGINEERING MANAGEMENT, POWER SECTOR
BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

- 1 SCOPE OF THE DOCUMENT
- 2 PURPOSE OF STORAGE & PRESERVATION
- 3 MEASURES TO BE TAKEN FOR STORAGE AND PRESERVATION
 - a) GENERAL STORAGE REQUIREMENTS
 - b) GENERAL PRESERVATION REQUIREMENTS
 - c) GENERAL INSPECTION REQUIREMENTS
- 4 TYPE OF STORAGE FOR VARIOUS EQUIPMENT
5. CONCLUSION
6. STACKING ARRANGEMENT FOR PLATES AND STRUCTURAL STEEL

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. 'No smoking' signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.
11. Following preservatives/preservation methods can be used depending upon type of equipment
 - a. Rust preventive fluid (RPF)
 - b. Rust protective paints
 - c. Tarpaulin covers, in case of outdoor storage
 - d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –
 - Ingress of moisture and corrosion damages.
 - Damage to protective coating.
 - Open ends in pipes, vessels and equipment -
 - In case any open ends are noticed, same shall be capped.
2. Any damages to equipment / materials.
 - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
 - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere. (C)**

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.



ii **Semi-closed storage. (S)**

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.





iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.



The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H ₂ SO ₄)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self-life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self-life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

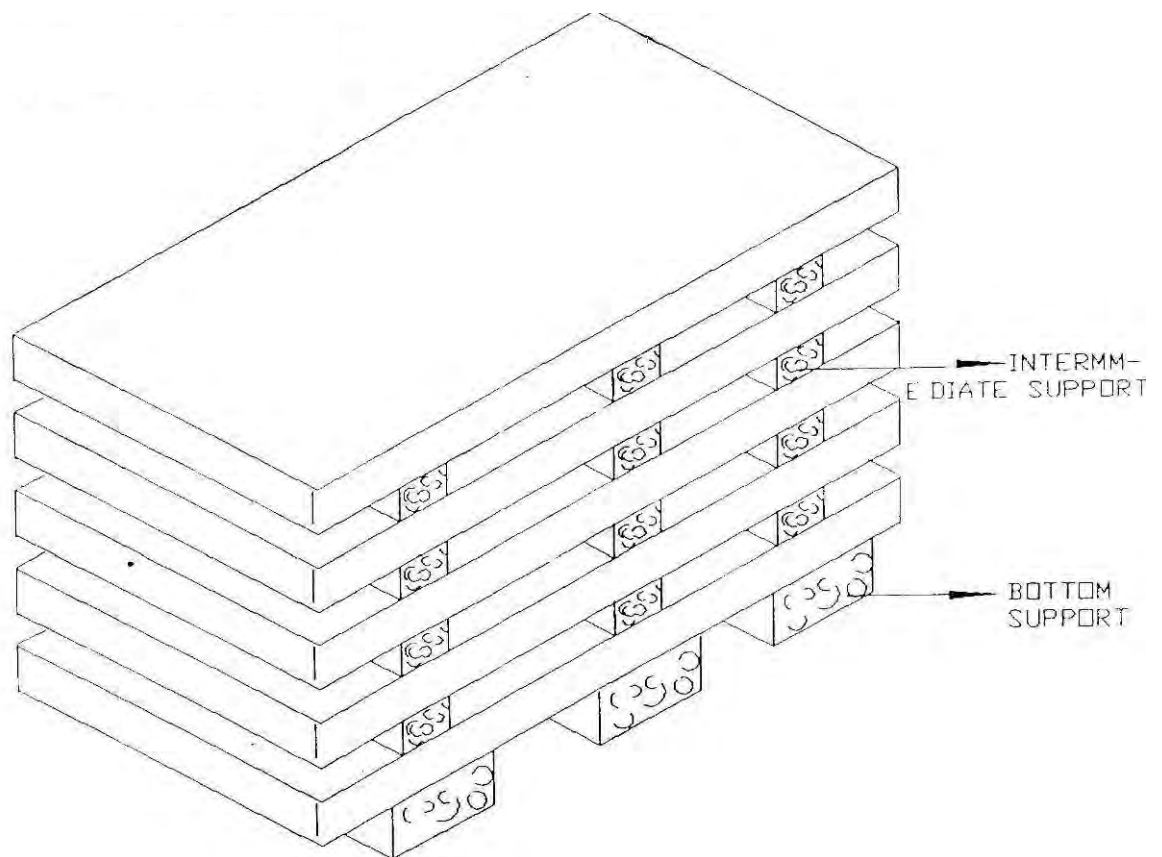


Figure – 1 – PLATE STACKING ARRANGEMENT

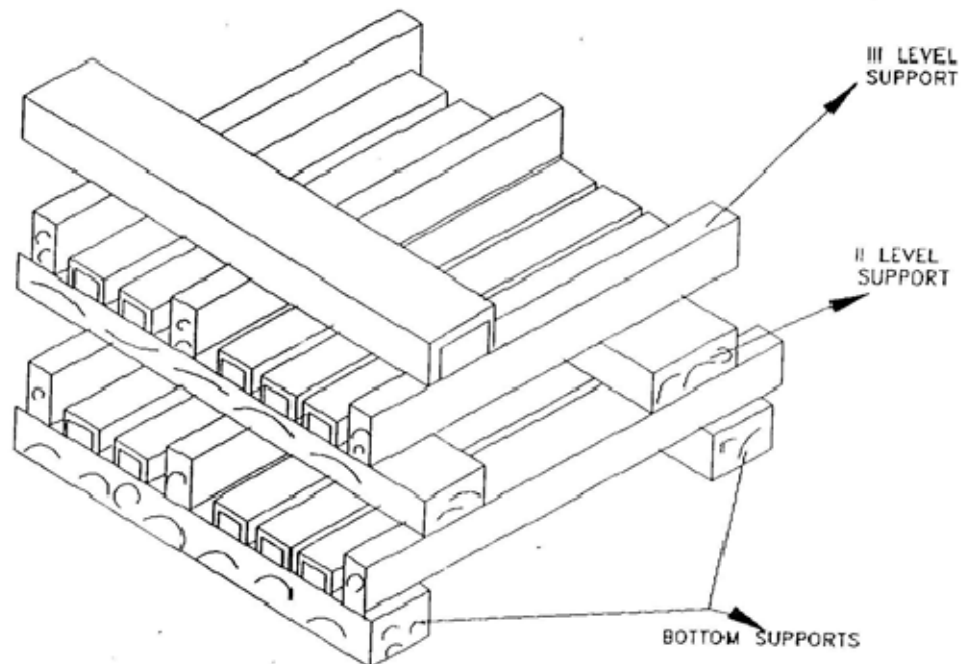


Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT



TITLE

**TECHNICAL SPECIFICATION
FOR
ELEVATOR**

SPECIFICATION NO. PE – TS – 298 - 502 – A001

VOLUME II B

SECTION IB

REV 0 DATE 07.12.2017

SHEET OF

SECTION –IB
SPECIFIC TECHNICAL REQUIREMENT (ELECTRICAL)



TITLE: ELECTRICAL EQUIPMENT SPECIFICATION FOR ELEVATOR ANPARA-D TPS (2X500MW)	SPECIFICATION NO.
	VOLUME NO. : II-B
	SECTION: C
	REV NO. : 00 DATE: 13/12/2017
	SHEET: 1 OF 1

CONTENTS

SECTION	TITLE	NO OF SHEETS
C	SPECIFIC TECHNICAL REQUIREMENTS	1
C	ELECTRICAL SCOPE BETWEEN BHEL & VENDOR	1
D	GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	7
D	MOTOR DATASHEET-C	2
C	ELECTRICAL LOAD DATA	1
D	TYPICAL DETAILS OF CABLE TRAYS	2
D	QUALITY PLAN (FOR MOTORS BELOW 55 KW)	2
D	QUALITY PLAN (FOR MOTORS ABOVE & 55 KW)	9



TITLE: ELECTRICAL EQUIPMENT SPECIFICATION FOR ELEVATOR ANPARA-D TPS (2X500MW)	SPECIFICATION NO.
	VOLUME NO. : II-B
	SECTION: C
	REV NO. : 00 DATE: 13/12/2017
	SHEET: 1 OF 1

SPECIFIC TECHNICAL REQUIREMENTS: ELECTRICAL

- 1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:
- a) Services and equipment as per "Electrical Scope between BHEL and Vendor".
 - b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.
 - c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
 - d) Erection and commissioning spares.
 - e) Erection & Maintenance tools & tackles.
 - f) Electrical load requirement for ELEVATORS.
 - g) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
 - h) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer /BHEL approval without any commercial and delivery implications to BHEL.
 - i) Various drawings, data sheet as per required format, quality plans, calculations, Type test & Routine test reports & certificates, operation and maintenance manuals, Complete technical literature with catalogues etc shall be furnished as specified at contract stage. All documents shall be subject to customer /BHEL approval without any commercial implications to BHEL.
 - j) Motor shall meet minimum requirement of motor specification.
 - k) The sub-vendor list for various electrical items is subject to BHEL/Customer approval without any commercial implications.
- 2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:
Refer "Electrical Scope between BHEL and Vendor".
- 3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID
- 3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following:
- a) A copy of this sheet "Electrical Equipment Specification for ELEVATORS and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
 - b) List of Erection and Commissioning spares.
 - c) List of Erection & Maintenance tools & tackles.
 - d) Electrical load requirement.
 - e) If there is any conflict, customer motor specification will prevail over BHEL motor specification.
- 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.
- 4.0 **LIST OF ENCLOSURES**
- 4.1 Electrical scope between BHEL & vendor (Annexure-I) - 1 sheet
 - 4.2 General Technical Requirements for LV motors (Annexure-II) - 5 sheets
 - 4.3 Data Sheet - A for LV Motors (Annexure-III) - 2 sheets
 - 4.4 Data Sheet - C for LV Motors (Annexure-IV) - 2 sheets
 - ~~4.5 Electrical Load data format (Annexure V) - 1 sheet~~
 - 4.6 Details of cable trays and troughs (Annexure-VI) - 2 sheets
 - 4.7 Quality plan for motor below 75kW (Annexure-VII) - 2 sheets
 - ~~4.8 Quality plan for motor above 75kW (Annexure-VIII) - 9 sheets~~

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGE: ELEVATORS

SCOPE OF VENDOR: SUPPLY , ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT : 2 x 500 MW ANPARA-D TPS

<u>S. NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&C</u>	<u>REMARKS</u>
1	Isolating Switch	Vendor	Vendor	BHEL will provide two number 415 V(3ph, 4W) supply feeder only up to isolating switches for elevators. Any other voltage level (AC/DC) required will be derived by the vendor. Motor starter shall be part of elevator control panel.
2	Power cables, control cables, screened control cables and any special cables (if required) between equipment supplied by vendor.	Vendor	Vendor	Cable from supply feeder to isolating switch shall be in BHEL scope.
3	Cabling material (cable trays, accessories, cable tray supporting system, conduits etc).	Vendor	Vendor	
4	Equipment Earthing	Vendor	Vendor	All equipment metallic enclosures / frames, metal structure etc. shall be grounded at two points each to the nearest grounding points / risers provided by BHEL.
5	Motors	Vendor	Vendor	
6	Cable glands and lugs for equipment supplied by vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power & control cables.
7	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
8	Equipment layout drawings	Vendor	-	
9	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.
PE-SS-999-506-E101
VOLUME NO. : **II-B**
SECTION : **D**
REV NO. : **00** DATE : 13.12.17
SHEET : 1 OF 1

(ANNEXURE-II)

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 13.12.17
		SHEET : 1 OF 4

1.0

INTENT OF SPECIFIATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer’s work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0

CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement of rotating electrical machines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines
IS:12615	Energy Efficient Induction Motors - Three Phase Squirrel Cage

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0

DESIGN REQUIREMENTS

3.1

Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2

Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3

Starting Requirements

3.3.1

Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2

Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

122 of 152

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 13.12.17
		SHEET : 2 OF 4
The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.		
3.3.3 The following frequency of starts shall apply		
i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.		
ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)		
iii) Motors for coal conveyor and coal crusher application shall be suitable fro three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be sutable fro minimum 20,000 starts during the life time of the motor		
3.4 Running Requirements		
3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.		
3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.		
3.5 Stress During bus Transfer		
3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.		
3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.		
3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.		
3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.		
4.0 CONSTRUCTIONAL FEATURES		
4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy		
4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.		
Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled.		
4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.		
4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors		

123 of 152

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 13.12.17
		SHEET : 3 OF 4
4.5	Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.	
4.6	In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.	
4.7	Terminals and Terminal Boxes	
4.7.1	Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A. Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".	
4.7.2	Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.	
4.7.3	Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or V W & V respectively.	
4.7.4	Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.	
4.7.5	Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.	
4.7.6	Degree of protection for terminal boxes shall be IP 55 as per IS 4691.	
4.7.7	Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.	
4.7.8.	Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.	
4.7.9	Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.	
4.8	Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.	
4.9	General	
4.9.1	Motors provided for similar drives shall be interchangeable.	
4.9.2	Suitable foundation bolts are to be supplied alongwith the motors.	

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 13.12.17
		SHEET : 4 OF 4

4.9.3

Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.

4.9.4

Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.

4.9.5

All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

4.9.6

Name plate with all particulars as per IS: 325 shall be provided

4.9.7

Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5.0

INSPECTION AND TESTING

5.1

All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.

5.2

LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.

5.3

All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.

5.4

Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

6.0

DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT

a)

OGA drawing showing the position of terminal boxes, earthing connections etc.

b)

Arrangement drawing of terminal boxes.

c)

Characteristic curves:
(To be given for motor above 55 kW unless otherwise specified in Data Sheet).

i)

Current vs. time at rated voltage and minimum starting voltage.

ii)

Speed vs. time at rated voltage and minimum starting voltage.

iii)

Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.

iv)

Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.

125

of 152



TITLE

LV MOTORS

DATA SHEET-A

2 x 500MW ANPARA-D POWER PROJECT

SPECIFICATION NO. PE-TS-298--553-A001

VOLUME II B

SECTION D

REV NO. 00 DATE 13.12.2017

SHEET 1 OF 2

ANNEXURE-III

- | | | | |
|------|---|---|---|
| 1.0 | Design ambient temperature | : | 50 °C |
| 2.0 | Maximum acceptable kW rating of LV motor | : | 200KW * |
| 3.0 | Installation (Indoors/ Outdoors) | : | As required |
| 4.0 | Details of supply system | | |
| | a) Rated voltage (with variation) | : | 415V $\pm$ 10% |
| | b) Rated frequency (with variation) | : | 50 Hz + 5 % to - 5% |
| | c) Combined voltage & freq. variation | : | 10% (sum of absolute values) |
| | d) System fault level at rated voltage | : | 50 kA for 1 sec |
| | e) Short time rating for terminal boxes | | |
| | o 90 kW and above (Breaker Controlled) | : | 50 KA for 0.25 sec. |
| | o Below 90 kW (Contactor Controlled) | : | 50 KA protected by HRC fuse |
| | f) LV System grounding | : | Solidly |
| 5.0 | Class of insulation | : | Class 'F', with temp rise limited to class B. |
| 6.0 | Minimum voltage for starting (As percentage of rated voltage) | : | 85% for motor ratings below 110kW
80% for motor ratings from 110kW to 200kW. |
| 7.0 | Power cables data | : | Shall be given during detailed engg. |
| 8.0 | Earth Conductor Size & Material | : | Shall be given during detailed engg. |
| 9.0 | Space heater supply | : | 240 V, 1 ϕ , 50 Hz |
| 10.0 | Rating up to which Single phase motor | : | Acceptable below 0.2 kW |
| 11.0 | Locked rotor current | | |
| | a) Limit as percentage of FLC | : | 720% incl. of tolerance as per IS: 325 |
| 12.0 | Flame-proof motor | | |
| | a) Enclosure suitable (As per IS: 2148) | : | Group – IIB for Fuel Oil area
Group – IIC for H2 Gen. plant area |
| | b) Classification of Hazardous area (As per IS: 5572 part-I) | : | As per requirement |
| 13.0 | Makes | : | BHEL/ Customer approval |
| 14.0 | Paint shade | : | Blue (RAL 5012) – Corrosion proof |
| 15.0 | Degree Of protection for motor/ terminal box | : | As per IS 4691 |

*** LT motors of continuous duty shall be energy efficient IE3 class conforming to IS12615**



TITLE

LV MOTORS**DATA SHEET-A**

2 x 500MW ANPARA-D POWER PROJECT

SPECIFICATION NO. PE-TS-298--553-A001

VOLUME II B

SECTION D

REV NO. 00 DATE 13.12.2017

SHEET 1 OF 2

16.0 TESTING**16.1 Type Tests**

For HT & LT Motors, type test reports for type tests as per IS: 325/ IS: 12615 conducted on equipment similar to those proposed to be supplied and carried out within last ten years shall be submitted. However, if such reports are not available, one motor of each type shall be subjected to type tests for free of cost.

16.2 Routine Tests

All motors shall be subjected to routine tests as per IS: 325/ IS: 12615 in the presence of customer or customer representative.

17.0 NAME PLATE

Motors shall have stainless steel name plate with all particulars as per IS: 325. In addition following information shall be indicated.

- a) Temperature rise in Deg. C under rated condition and method of measurement.
- b) Degree of protection.
- c) Bearing identification no. and recommended lubricant.
- d) Location of insulated bearings.

	TITLE LV MOTOR DATA SHEET - C	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE
		SHEET 1 OF 2

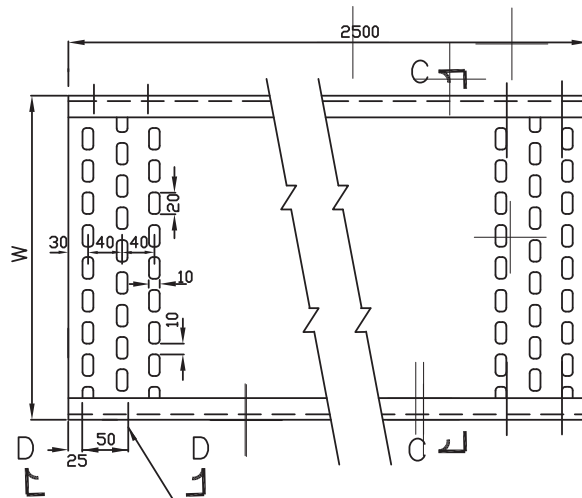
S. No.	Description		Data to be filled by successful bidder
A.	General		
1	Manufacturer & country of origin		
2	Motor type		
3	Type of starting		
4	Name of the equipment driven by motor & Quantity		
5	Maximum Power requirement of driven equipment		
6	Rated speed of Driven Equipment		
7	Design ambient temperature		
B.	Design and Performance Data		
1	Frame size & type designation		
2	Type of duty		
3	Rated Voltage		
4	Permissible variation for		
5	a	Voltage	
6	b	Frequency	
7	c	Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)		
9	Synchronous speed & Rated slip		
10	Minimum permissible starting voltage		
11	Starting time in sec with mechanism coupled		
12	a) At rated voltage		
13	b) At min starting voltage		
14	Locked rotor current as percentage of FLC (including IS tolerance)		
15	Torque		
	a) Starting		
	b) Maximum		
16	Permissible temp rise at rated output over ambient temp & method		
17	Noise level at 1.0 m (dB)		
18	Amplitude of vibration		
19	Efficiency & P.F. at rated voltage & frequency		
	a) At 100% load		
	c) At 75% load		

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

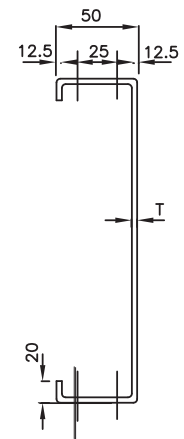
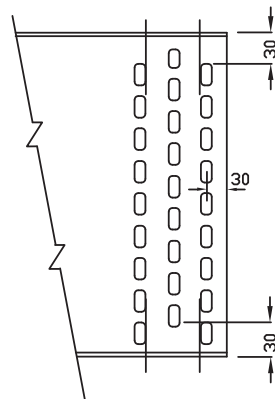
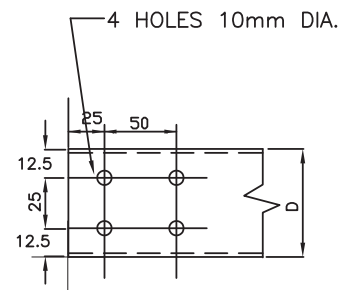
	TITLE LV MOTOR DATA SHEET - C	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE
		SHEET 2 OF 2

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	Constructional Features	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	Characteristic curves/ drawings (To be enclosed for motors of rating $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



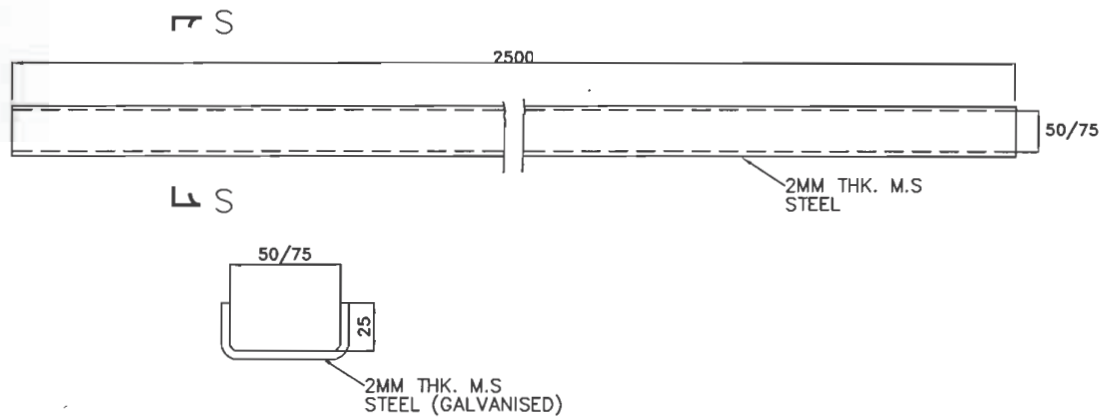
4 HOLES 10mm DIA.

SECTION-CC
(100/50 TRAYS)ARRANGEMENT OF
PERFORATIONSVIEW-DD
(100,50W TRAYS)

TRAY WIDTH W (mm)	100	50
TRAY DEPTH D (mm)	50	50
T (mm)	2	2

PERFORATED TYPE TRAYTYPICAL DETAILS OF CABLE TRAYS AND
ACCESSORIES

DWG. NO.



SECTION S-S

CABLE TROUGHS

SEE GENERAL NOTES IN SHEET 11.

TYPICAL DETAILS OF
CABLE TRAY AND ACCESSORIES

SH 10 OF 11

REV 00

		CUSTOMER :		PROJECT		2X500MW ANPARA-D TPS		SPECIFICATION :			
QUALITY PLAN		BIDDER/ VENDOR		TITLE		QUALITY PLAN		NUMBER :			
		SYSTEM		NUMBER PED-506-00-Q-006, REV-01		SPECIFICATION					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION		
									AGENCY	P	W
1	2	3	4	5	6	7	8	9	10	11	
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUF'R'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	
3.0	TESTS	1.ROUTINE, TYPE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1*	* NOTE -1 & NOTE-3
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	NOTE -1 & NOTE-3
BHEL		PARTICULARS		BIDDER/VENDOR							
		NAME									
		SIGNATURE									

	QUALITY PLAN		CUSTOMER :		PROJECT TITLE		2X500MW ANPARA-D TPS		SPECIFICATION : NUMBER :			
	BIDDER/ :		SYSTEM VENDOR		QUALITY PLAN		NUMBER PED-506-00-Q-006, REV-01		SPECIFICATION : TITLE :			
	SHEET 2 OF 2		CAT.		EXTENT OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORM		FORMAT OF RECORD	
	COMPONENT/OPERATION CHECK		TYPE/METHOD OF CHECK		6		7		8		9	
1	2	3	4	5	6	7	8	9	10	11		
3.NAMEPLATE DETAILS MA VISUAL 100% IS-325 & DATA SHEET IS-325 & DATA SHEET INSPN. REPORT												
NOTES: ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR; HOWEVER, BHEL SHALL WITNESS ROUTINE, TYPE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON. TYPE TEST CERTIFICATES ON SIMILAR RATING OF MOTOR SHALL BE FURNISHED FOR APPROVAL. TYPE TEST CERTIFICATE SHALL NOT BE OLDER THAN FIVE(5) YEARS FROM THE DATE OF INSPECTION, OTHERWISE TYPE TEST TO BE CONDUCTED FREE OF COST. 1 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. 2 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW . ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY. 3 <u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL		PARTICULARS		BIDDER/VENDOR								
		NAME										
		SIGNATURE										
		DATE										
BIDDER'S/VENDORS COMPANY SEAL												

	TITLE TECHNICAL SPECIFICATION FOR ELEVATOR	SPECIFICATION NO. PE – TS – 298 - 502 – A001	
		VOLUME	II B
		SECTION	IC
		REV 0	DATE 07.12.2017
		SHEET	OF

**SECTION – IC
DATA SHEET A**

	TITLE: DATA SHEET - A FOR BUILDING ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IC	SUB-SECTION
		REV. 00	DATE: 07/12/2017
		SHEET 1 OF 4	

S. No.	DESCRIPTION	PASSENGER ELEVATOR	
		Service building	Admin building
1.	Elevator		
2.	Type of Service	Passenger elevator, Panoramic Type	Passenger elevator, Panoramic Type
3.	Rated Load on Elevator	1088 KG (16 Person)	884 KG (13 Person)
4.	Quantity	2 Nos. (One nos.)	2 Nos. (One no.)
5.	Rated Speed of Lift	1.0 M/Sec	1.0 M/Sec
6.	Total Travel	17 M	8.50 M
7.	Nos. of floors to be served	Five (5) Nos. including Ground	Three (3) Nos. including Ground
8.	Method of control.	ACVVVF Control with automatic level adjustment.	
9.	Position of Machine Room	Directly above the lift Shaft.	
10.	Car enclosure construction, design and finish car.	SS -304, min 1.5 mm thick. sheet,	
11.	Design, construction, installation codes including car size, door size, Shaft size, Size of platform and car entrance.	As per IS: 14665 (all parts), latest edition	
12.	Car and landing door	Protected by central opening sliding stainless steel door (Horizontal bi-parting door).	
13.	Flooring	Vitrified ceramic tiles of mat finish.	
14.	Operation	Automatic simplex collective with and without attendant with provision for locking control in "auto" or "Attendant" position. Key type lock switch shall be provided.	
15.	Signal	Car position indicator in car, car position indicator at car floors, telltale lights at all floors, battery operated alarm bell and emergency light with suitable battery, battery charger and controls, Remote alarm shall be provided.	
16.	Method of operation of car and landing doors.	Power operated with automatic door opening and closing devices.	
17.	Lighting & fan	One cabin fan, CFL /LED light fittings on car roof. Lux level : 100 min.	
18.	Power supply : a) Power b) Lighting & fan	415 Volts, (+/- 10% variation), 3 Phase, 50 Hz (+5% to -5% variation), combined voltage variation 10%, 4 wire system, 240 Volts, 1 Phase, 50 c/s.	
19.	Other requirements	Internal telephone wiring and telephone hand set to be provided. The external connection shall be provided by Customer. Also, automatic rescue device shall be provided.	

	TITLE: DATA SHEET - A FOR BUILDING ELEVATOR		SPEC. NO. PE-TS-298-502-A001	
			VOLUME IIB	
			SECTION IC	SUB-SECTION
			REV. 00	DATE: 07/12/2017
			SHEET 2 OF 4	
20.	Additional requirements :-			
a)	Isolating cushion between car and car frame shall be provided.	Type of cushion shall be rubber pad or spring which shall be as per manufacturer's standard.		
b)	Three pin plug with socket on car top	5/15A, 3 pin plug socket with switch on top of lift car and inside shaft to take care maintenance requirement.		
c)	Car frame Material and type of construction	Steel and bolted construction		
d)	Landing Door	Fire rated for min. 2 hour		
e)	Type of operation	Automatic		
f)	Door hanger tracks along with accessories shall be provided.	Required		
g)	Safety shoes complete with accessories shall be provided.	Yes		
h)	Safety device for door operation shall be provided.	Full length Infrared light curtain along with pressure limiter as an extra mechanical safety is required.		
i)	Handrails on three sides of car	Mirror finish stainless steel		
j)	False ceiling	SS 304		
k)	Emergency stop switch	Yes		
21.	Control and operation			
	(a)Type of control	Simplex		
	(b)Type of drive	Variable voltage variable frequency drive		
22.	Car operating panel	Provided		
	(a)Type of construction	Partial Height car operating panel (COP), Removable type from Car with SS face plate.		
	(b)Push Buttons	Luminous push buttons with IP 54		
23.	Car position indicator	Provided.		
	(a)Type of construction	As per manufacturer's standard		
	(b)Type of display	7 segment LED display.		
24.	Push button station and call registered tell tale lights at each landing	Provided in each landing		
	(a)Type of construction	Box type with SS face plate		
	(b)Push Buttons	Luminous push buttons with IP 54		
25.	Apron / Facia Plate provided as per IS 14665	Yes (To be provided by supplier)		
26.	Emergency Light	Required		
27.	Terminal buffers, their types and number of buffers	Spring buffers shall be Provided as per IS 14665.		
28.	Load plate	As per manufacturer's standard / as applicable		
29.	Counter weights frame	Fabricated Steel Construction		

	TITLE: DATA SHEET - A FOR BUILDING ELEVATOR		SPEC. NO. PE-TS-298-502-A001	
			VOLUME IIB	
			SECTION IC	SUB-SECTION
			REV. 00	DATE: 07/12/2017
			SHEET 3 OF 4	
30.	Counter weight fillers	Cast Iron		
31.	Number of Limit Switches	As per requirement		
	a) Location	Bottom & top terminal		
	b) Type	Electromechanical		
	c) Operation	Cam Operated		
32.	Controller and type	Selective Collective Controller with variable voltage variable frequency drive and Microprocessor based software controlled logic system		
33.	Reverse phase relay and other protective devices	Required		
34.	Car Safety & Governor			
	a) Stopping distance	As per IS:14665		
	b) Type and mode of operation of Over speed Governor device	Centrifugal action		
	c) Tripping speed and design code conforming to	As per IS 14665		
	d) Location	At machine room		
35.	Motor details			
	(a) Type	3 phase AC squirrel Cage Induction motor		
	(b) Type of Duty	Lift Duty		
	(c) Motor Duty	S4 /S5		
	(d) Duty Cycle of Motor	60%		
	(e) Applicable standard	IS:325		
	f) No. Of Starts Per Hour	Elevator Motor shall be suitable for minimum of 150 Starts per hour.		
	g)Direction of rotation	Both Clockwise & Anticlockwise		
	h)Class of Insulation	F, temp rise limited to class B. Motor shall be provided with thermal class 130 (B) or better insulation.		
	i)Method of Starting	AC Variable Voltage Variable Frequency Drive		
36.	Door Motor			
	a) Equipment driven by Motor	Door		
	b) Direction of rotation	Both Clockwise & Anticlockwise		
	c) Type of enclosures	IP54		
37.	Metallic Wire Mesh between Car & Counter Weight	Required		
38.	Fire Man Switch	Required		
39.	Sound Reducing Material	Isolation Rubber / other arrangement in the Machine shall be provided		
40.	Automatic Rescue Device (Battery Drive)	Provided		
41.	Trailing cables	FRLS type.		
42.	Design seismic coefficient	According to IS 1893 - 1977		

	TITLE: DATA SHEET - A FOR BUILDING ELEVATOR	SPEC. NO. PE-TS-298-502-A001	
		VOLUME IIB	
		SECTION IC	SUB-SECTION
		REV. 00	DATE: 07/12/2017
		SHEET 4 OF 4	

	(An additional information for elevators building only).	
43.	Window Air condition in Each elevator machine room.	As per Machine room area (not less than 2T Capacity).
44.	1/2 Kg CO2/suitable type Fire extinguisher with fixing arrangement.	Provided.

	TITLE TECHNICAL SPECIFICATION FOR ELEVATOR	SPECIFICATION NO. PE – TS – 298 - 502 – A001	
		VOLUME	II B
		SECTION	IB
		REV 0	DATE 07.12.2017
		SHEET	OF

SECTION –IIA
STANDARD TECHNICAL SPECIFICATION REQUIREMENT (ELECTRICAL)



TITLE

TECHNICAL SPECIFICATION of VVVF Drive For Elevator

SPEC. NO. PE-TS-298-502-A001

VOLUME II - B

SECTION - IIA

DATE 07.12.2017

SUB SECTION

SHEET

1 OF 5

1.0 General

- a) This part of the specification describes the general requirements for the Variable Voltage Variable frequency Drives, herein referred to as AC Drives, for use with standard IEC design AC squirrel cage induction motors. The nominal values, the standard documents and the drive's minimum performance are defined in this part. **To avoid any mismatch between the motor and its control equipment, the AC Drive shall be capable of auto adjustment by automatic measurement of the motor parameters with/without motor rotation.**
- b) Inverter construction and related devices:

Construction shall be divided in 3 broad sections. Section one converts AC Supply into DC supply. Section 2 Converts and controls DC supply into AC Supply with regulation. Section 3 shall be used for braking action of the motor and Dynamic Braking Unit (DBU) can be inbuilt or external depending upon the drive capacity. VVVF can be used in open loop (without external speed feed back) like in Travel motions or close loop (With external speed feed back) like in Hoist motions. Like all other electronic / electric devices VVVF drives are also protected by MCB / MCCB / Fuses. VVVF drives are sensitive to temperature and hence drive internal as well as external cooling fans are provided.

- c) Programming of VVVF Drives.

VVVF drives shall be programmable and for that purpose detachable digital Operator display unit shall be supplied along with the VVVF having required buttons for setting the user constant, functions etc. The VVVF drive is to be fine tuned by matching the motor parameters and setting the parameters on full load.

- d) VVVF drives shall be connected with power supply and these drives generate their own low voltage control supply. Potential free contacts shall be connected to this control supply and few programmable control terminals. Starting / stopping / set speeds operations of VVVF drive shall be achieved by above control connection.
- e) VVVF shall give smooth control over acceleration and deceleration making the motion jerk free and using Variable voltage variable frequency limits the inrush current to the squirrel cage motors. VVVF provides controlled torque to the motor due to which elevator operations are jerk free.

1.1 Experience

The Frequency Converter Manufacturer shall have adequate experience in frequency converter manufacturing and have adequate business volume in order to provide credibility in his commitments and a capability of long term support.

1.2 Local support

The Supplier shall have a permanent representative office with a trained and skilled support staff, in the country where the goods are delivered, in order to prove his commitment for local support and to provide a channel for communication.



TITLE

TECHNICAL SPECIFICATION of VVVF Drive For Elevator

SPEC. NO. PE-TS-298-502-A001

VOLUME II - B

SECTION - IIA

DATE 07.12.2017

SUB SECTION

SHEET

2 OF 5

The engineers employed by the Supplier's regional office shall be certified by the Manufacturer and provide start-up service including physical inspection of the drive, connected wiring and final adjustments, to ensure that the AC Drive meets the required performance.

The Supplier shall be able to give basic drives training to the Customer's engineers, preferably on the site. The training shall, as a minimum, include system concepts and basic troubleshooting.

2.0 Basic requirements for the AC Drives

2.1 General requirements

The AC Drive shall comply with National (country of origin) and International standards and the recommendations for electrical industrial control devices (IEC, EN, UL, NFC, and VDE).

The AC Drive shall be of the most modern design, yet user friendly and be simple to install commission and maintain. The AC Drive shall be able to start and control the speed of a standard squirrel cage induction AC motor. The AC Drives shall be: CE marked, conforming to European Low Voltage (73/23/CEE and 93/68/CEE) and EMC (89/336/CEE) Directives, UL/CSA marked according to UL 508C.

The AC Drives have to be built to comply with the IEC standards.

The AC Drive shall be a digitally controlled drive, using, at least, the Pulse Width Modulation (PWM) with flux vector control open loop (for travel) and closed loop (for hoist). It shall have diodes / thyristors in rectifier and IGBT's in the inverter section in their entire power range, and it shall have the following minimum specifications.

Rated Input Voltages	380V to 480V (-10% to +10% variation), three-phase
Rated Input Frequency	50Hz +5 % to - 5%
Output Voltage	0 – Input voltage, three-phase
Output Frequency Range	0 to 400 Hz
Acceleration / Deceleration Time	0.01 – 999s, adjustable, linear, with S, with U or customised shapes
Overload capability (Constant Torque)	150% of nominal current for 1min.
Operating ambient Temperature	-10°C up to 50°C (shall be de-rated suitably if not rated at 50°C)



TITLE

TECHNICAL SPECIFICATION of VVVF Drive For Elevator

SPEC. NO. PE-TS-298-502-A001

VOLUME II - B

SECTION - IIA

DATE 07.12.2017

SUB SECTION

SHEET

3 OF 5

Storage ambient Temperature	-25°C up to 70 °C
Maximum operating altitude	1000 m without de-rating, 1000...3000 (shall be de-rated suitably)
Max. Relative Humidity	95 %, without condensation and dripping water.
Main Protections	Over current, short circuit between phase, short circuit between phase and ground, input phase loss, output phase loss, motor overload, over speed, over voltage, under voltage, drive over temperature

The AC Drive shall be able to give a 100 % output current continuously in the above specified conditions. In order to ensure that the drive can provide the required output current in the specified ambient conditions, the Manufacturer shall inform the required de-rating, if the ambient temperature given in the project-specific specification is higher than rated ambient of the drive or if the installation altitude is more than 1000 m above the sea level. The de-rating factor shall be specified so that neither the lifetime of the AC Drive nor the unit's performance, overload capability included, nor the reliability of the AC Drive shall suffer.

Suitable encoder shall be provided for main hoist motion.

3.0 User interface

3.1 General

The user interface shall be identical throughout the power range and type to avoid confusion amongst the users and need for training in several different units.

3.2 Inputs and outputs

A. At least, the following standard Inputs and Outputs shall be provided, to be used in interface with the control system:

Analogue Inputs : 1 x Programmable differential voltage input $\pm 10V$,
1 x Programmable current input 0(4) - 20mA
1 x Programmable voltage input 0 – 10V
Analogue Output : 1 x Programmable analogue outputs 0(4) - 20mA or 0 – 10V
Logic inputs : 6 x Programmable logic Inputs isolated from the mains
Relay Outputs : 2 x Programmable Digital outputs with a changeover dry contact

All the control terminals shall be clearly marked.



TITLE

TECHNICAL SPECIFICATION of VVVF Drive For Elevator

SPEC. NO. PE-TS-298-502-A001

VOLUME II - B

SECTION - IIA

DATE 07.12.2017

SUB SECTION

SHEET

4 OF 5

B. At least, it shall be possible to assigned the following functions to the I/Os:

Analogue input	Analogue outputs
Speed reference Summing reference	Motor current Motor frequency Motor torque Motor power
Logic input	Relay or logic outputs (open collector)
Forward Reverse Jog Preset speeds Reference switching Ramp switching Parameter sets selection Fast stop Freewheel stop + speed - speed External fault	Ready Drive running High speed attained Drive fault Frequency threshold attained Motor thermal state attained Torque or current limitation attained Brake control

3.4 Programming terminal

- A. The AC drive shall have a keypad /display for programming and controlling purposes. An IP54 or IP65 remote mounting shall be possible at a distance of 10m.
- B. Password protection shall be provided to avoid unauthorized tampering with the set parameters.
- C. The programming terminal shall be able to display the commercial reference of the AC drive and of the options, the software version, the serial number
- D. Direct keypad entry shall be provided to observe the following actual parameters. Any one of the following parameters or actual values shall be selected to be always displayed:
 - i) Input Voltage
 - ii) Input Frequency
 - iii) Output Frequency
 - iv) Output Power
 - v) Output Current
 - vi) Motor Speed



TITLE

TECHNICAL SPECIFICATION of VVVF Drive For Elevator

SPEC. NO. PE-TS-298-502-A001

VOLUME II - B

SECTION - IIA

DATE 07.12.2017

SUB SECTION

SHEET

5 OF 5

The following parameters shall always be displayed during normal operation:-

i) Drive Status

The following drive control functions at least shall be available from the keypad:-

- i) Run
- ii) Stop
- iii) Local / Remote selection.
- iv) Forward/Reverse (if function enabled)
- v) Accelerate
- vi) Decelerate
- vii) Parameter setting

3.5 Application programming

The AC Drive shall be designed for both simple and the most complicated applications, yet it shall be user friendly. It shall be possible to reset the parameter settings back to the original factory settings through the keypad.

3.6 PC Tools

The AC Drive Supplier shall have Windows based PC software available for monitoring and controlling the AC Drives, and the software shall be offered as an option. The software shall be supplied with the necessary hardware and a provision for connecting a PC with the AC Drives. It shall be possible to set and modify parameters, control the drive, read actual values and make trend analysis using the software.

4.0 Software features

A. Restart

In the event of a fault trip due to over voltage, over current or loss of analogue signal, the AC DRIVE shall be programmable to attempt an automatic restart. For safety reasons, the maximum number of attempts shall be within a selectable time. If the fault does not clear after the attempts, the drive shall lock out.

B. Brake logic control

The AC Drive shall have a built-in function to control a mechanical brake in order to move the load in a smooth and safe way. The brake logic control shall be adapted to the different movements: hoisting, travel, orientation.

5. Preferred makes:

As per List of Makes- Annexure-I.

	TITLE TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. PE – TS – 298 - 502 – A001			
		VOLUME	III		
		SECTION- III			
		REV	0	DATE	07.12.2017
		SHEET		OF	

SECTION– III
(DOCUMENTS TO BE SUBMITTED BY THE BIDDER)

	TITLE TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. PE – TS – 298 - 502 – A001	
		VOLUME III	
		SECTION- III	
		REV 0	DATE 07.12.2017
	SHEET	OF	

Index

III A	List of documents to be submitted with bid.
III B	Compliance cum confirmation certificate.
III C	Electrical load list.
III D	Schedule of Technical Deviation
III E	Pre Bid Clarification Schedule

	TITLE TECHNICAL SPECIFICATION FOR ELEVATOR	SPEC. PE – TS – 298 – 502 – A001		
		VOLUME	III	
		SECTION- IIIA		
		REV	0	DATE 07.12.2017
		SHEET		OF

BIDDER HAS TO SUBMIT ONLY FOLLOWING DOCUMENTS ALONG WITH THE OFFER, FOR TECHNICAL EVALUATION OF THE BID:-

- 1) Schedule of technical deviation (if any)
OR
'NO DEVIATION CERTIFICATE' – Clearly mentioning that bidder has considered 'No - Deviation' from the technical specification provided by BHEL.
- 2) Signed and stamped copy of compliance cum confirmation certificate.
- 3) Unpriced format, duly mentioned 'Quoted' against each Sl. No. / Clause no.
- 4) Signed and stamped copy of :
 - a) "Specific-Electrical Equipment Specification for elevator.
 - b) "Electrical Scope between BHEL and Vendor" sheet.
 - c) Compliance to /duly filled "Electrical Load Data" sheet.
- 5) Duly signed & stamped copy of civil assignment input drawings.

Note 1:- Any other standard document/ details furnished by the bidder i.e. Data sheet / GA Drawing/ QAP etc. shall not be taken in to consideration for evaluation.

Note 2:- Bidder to note that if the bidder does not submit the documents mentioned in Sl. No. 1.0 to 5.0 along with their offer then their offer is liable to be rejected.



TITLE

2X500 MW ANPARA D TPS

SPECIFICATION NO. PE-TS-298-502-A001

REV 1

Section III

COMPLIANCE CUM CONFIRMATION CERTIFICATE

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate (every sheet) and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under "exclusion" and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance
- e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer's decision shall be binding on the bidder whenever the deficiency is pointed out. For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
- h) Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions.
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account
- j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
- k) As built drawings shall be submitted as and when required during the project execution.
- l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

	TITLE 2X500 MW ANPARA D TPS <
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LOAD TITLE	RATING (KW)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		SIZE CODE	NOs													
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SERVICE BUILDING ELEVATOR																		
ELEVATOR MOTOR	16.5		S	2	0	D	S	-	C		Each Elevator Machine room of Service Building.							
2 T A/C FOR SERVICE BUILDING ELEVATOR M/C ROOM AND LIGHTING FOR ELEVATOR M/C ROOM & SHAFT AND MAINTENANCE AND INSTALLATION REQUIREMENT	7		S	2	0	D	S	-	C		Each Elevator Machine room of Service Building.							
ADMINISTRATIVE BUILDING ELEVATOR																		
ELEVATOR MOTOR	16.5		S	2	0	D	S	-	C		Each Elevator Machine room of Admin Building							
2 T A/C FOR Admin BUILDING ELEVATOR M/C ROOM AND LIGHTING FOR ELEVATOR M/C ROOM & SHAFT AND MAINTENANCE AND INSTALLATION REQUIREMENT	7		S	2	0	D	S	-	C		Each Elevator Machine room of Admin Building							
Note: 1) No other single phase or 3 phase supply shall be provided for elevator erection / operation etc. 2) Only two (3 phase) supply feeders per elevator shall be provided one feeder shall be dedicated to elevator motor and other 3 phase supply feeder shall be provided by BHEL for air conditioner, machine room and shaft lighting and maintenance / installation requirement. Bidder to consider CT in their scope for stepping down the voltage as per their requirement. Bidder to note: Feeder of indicated rating shall be provided by BHEL. If motor rating is lesser than the provided feeder rating, bidder shall provide protection against over current																		
NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL) 2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (DC): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V : ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTOR CONTROLLED)																		
	LOAD DATA (ELECTRICAL)	JOB NO.		298		ORIGINATING AGENCY				PEM (ELECTRICAL)								
		PROJECT TITLE		2X500 MW ANPARA D TPS				NAME				DATA FILLED UP ON						
		SYSTEM / S		ELEVATOR				SIGN.				DATA ENTERED ON						
		DEPTT. / SECTION		MAUX / MH 150 of 152				SHEET 1 OF 1		REV. 00		DE'S SIGN. & DATE						

DEVIATION SHEET (COST OF WITHDRAWAL)**PROJECT:- 2X500 MW ANPARA D TPS.****PACKAGE:- ELEVATOR****TENDER ENQUIRY REFERENCE:-****NAME OF VENDOR:-**

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWAL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWAL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWAL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
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TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE	

NOTES:

1. For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
14. In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.



TITLE

TECHNICAL SPECIFICATION FOR
ELEVATOR
2X500 MW ANPARA D TPS

SPECIFICATION NO. PE-TS-298-502-A001

VOLUME III

REV 00

DATE 07.12.2017

SHEET 1 OF 1

PRE-BID CLARIFICATION SCHEDULE

S. No.	Section/Clause /Page No.	Statement of the referred clause	Clarification Required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL